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The Water Heating Business

WE have before us particulars of schemes for the hire of water heaters that have been introduced by a number of supply undertakings in south-east England, which may be regarded as typical of general practice in this country. Of the four standard types of self-contained heater—pressure, non-pressure, non-pressure with broken feed and cistern—none appears to have secured pre-eminence, and co-ordinated information is wanted as to the relative values of each kind in different circumstances.

Immersion heaters also are hired out by about half the undertakings under consideration. While the use of these permits a cheap conversion of existing tanks exceeding 20 gallons in capacity, the saving in capital expenditure must be set against greater heat losses unless care is taken with the heat insulation; one undertaking reports considerable success due to attention to this point. Tariffs vary from 0.25d. per kWh in the summer in one case and 0.33d. in five cases (usually for night supply with a mid-day boost) to 0.75d. and 0.875d., but the higher rates are likely to secure only the cream of the business.

The capacities of the storage heaters hired usually range from 1½ to 30 gallons. Hire charges average about 3s. per quarter for the 1½-gal. size and 10s. for the 30-gal. size, but some are much more. Few undertakings cover complete installation in their quarterly charges, and the general practice is to leave the consumer to arrange for his own plumbing. Nevertheless, we think more might be done towards handing over the job complete to the consumer.

The cost of plumbing work seems to approximate to that of the electrical connections, *viz.*, from 20s. to 25s., but varies considerably more with conditions. A 30-ft. run of free cable is allowed in the majority of cases. The general custom is to set thermostats to operate within a margin of 5 to 15 deg. F. We should like further information as to the effect on the diversity of demand of adopting the wider range.

A most satisfactory feature of our investigation has been the consensus of opinion revealed that troubles with modern heaters are practically negligible. A few report slight troubles due to the erratic operation of thermostats, and others leaky valves and washers with the non-pressure types, but scale formation is by far the chief item in maintenance, and for dealing with it adequately a well-organised workshop is necessary. The time between descalings depends largely upon the hardness of the water, but also upon sludge formation. The period is extended in many cases by limiting the maximum temperature of the water to from 160 to 175 deg. F.

It is quite clear that undertakings which have gone all out for this class of load have no cause to repent their activity. There is still scope for discussion among manufacturers on several points, including nomenclature. We have indicated a few of these and hope that the Water Heating Committee appointed by B.E.A.M.A. will shortly be able to provide information that will assist progress.

Another Electricity Bill

THE Electricity (Supply) Bill, 1934, was read a first time in the House of Lords on March 27th. It is a short plainly framed measure which is unlikely to be contentious, since it does not seek the imposition of anything of a revolutionary nature. The first provision is intended merely to regularise the manner in which authorised undertakers' generating stations which are not "selected" for grid purposes shall be operated, or closed down. This introduces greater flexibility and settles difference of legal opinion on the subject such as led to the promotion of the Taunton and Torquay Bills. Secondly, it is proposed to authorise the Board to supply energy at special prices and under special conditions in special circumstances. Thirdly, it is proposed to so amend Sec. 12 of the 1926 Act as to introduce a greater degree of equitability into the computation of transmission charges and allowances included in the price of indirect bulk supplies. Finally, it empowers the Central Board to supply electricity directly to railway companies. This is not an attempt to enter the distribution field; but solely an effort to relieve the railway companies of the necessity for making many separate agreements for the supply of power at different points

en route. By obtaining the right to negotiate terms for the whole route, as it did in the case of the Southern Railway Co.'s London-Brighton conversion, the Board will remove one of the possible obstacles to railway electrification.

Emergency Governors

The official inquiry into the running away of the 5,000-kW turbo-alternator at Ifor power-station, Dowlais, last year, shows conclusively that defects in manufacture were not responsible. This, in a way, makes the occurrence the more disturbing. Apparently, the governor was working satisfactorily, but the shearing of a small pin permitted the admission of excess steam on light load. That would have been a minor trouble had not the emergency governor failed to operate; this is attributed to dirt or carbonised oil preventing the rotation of a small spindle which should have released the oil pressure in the throttle oil pot. The importance of the mishap lies in this: the reliability of turbines is such that they are run continuously for long periods which leave no opportunities for periodic testing of the emergency governors, and this tendency is likely to increase. The suggestions of Messrs. K. Preston and C. W. Price, who conducted the inquiry, regarding the provision of additional means of emergency steam isolation should receive the consideration of designers.

Meeting Trains

The Great Western Railway Co. is to be commended on its appreciation of the desire of the public for the prominent display of full information regarding the arrival of trains—platform, time due, minutes late (if any), and stations served—as well as their departure. Still more is the company to be congratulated on its decision to do it electrically. The easily and cheaply operated system designed by Siemens Bros. & Co.—rather on the lines of a "tote"—that has just been put into use at Paddington is, we believe, the first of its kind in the world. All who have had to meet trains at our larger termini will hope that other main line companies will soon adopt equally convenient schemes.

Electricity Ad Lib.

The manager of the San Joaquin Light and Power Corporation, California, recently became perturbed at the economisation in electricity of the company's consumers, and came to the conclusion that something would have to be done to shake them out of their pernicious habits. So this gentleman, described by an American contemporary as "dynamic, tradition busting," decided that all consumers should be given a free hand during the months of April and May. By paying the same amount as their March bill they may use as much electricity as they like. As the company has an ample reserve of hydro-electric power and a distribution system designed for a much larger load than the present one it will not lose any money by its generosity. And it is hoped that the consumers, once having "got the taste" of unlimited use, will keep it up in the future. Their way will be made easier by a drastic reduction in charges which is to come into force in June.

Sheffield Extensions

The second Blackburn Meadows station, which was started up about twelve months ago as a single-unit station (Electrical Review, March 24th, 1933), is to be extended by a 30,000-kW set with boilers. A similar extension will be made at Neepsend, and the capital expenditure for works in immediate prospect will amount to £770,000. We hope that this implies that Mr. E. Morgan, the general manager of Sheffield Electric Supply Department, has some further furnace load in prospect, such as the new installation of five- and two-ton high-frequency furnaces at the Stockbridge works of Messrs. Samuel Fox & Co. The larger of the two furnaces has, we believe, the greatest capacity of any h.f. furnace so far made in Great Britain, but the good efficiency and operating characteristics of this type should ensure its rapid development.

The New Klip River Station

Articles recently published in these columns have indicated a promise of considerable electrical activity in South Africa during the next few years. The decision to erect a 350,000-kW station on the Klip River is based upon far-sighted and optimistic views, which in electrical matters usually amount to the same thing. The large size of the station lends support to the opinion held in some quarters that the Government is seriously contemplating electrifying the suburban railway system on the Witwatersrand. It also illustrates another point of more general application: the concentration of generating plant in a base load station has been brought about partly because, with the increasing electrification of the Rand mines, the available condensing water is proving inadequate for local stations, and a plentiful supply of water for maintaining a high vacuum is the most important limiting factor in station design.

Industrial Aids Domestic

Like most other authorities operating in industrial areas, the Shropshire, Worcestershire and Staffordshire Electric Power Co. recorded a distinct, though slow, improvement in the volume of supply taken by industrial consumers during the latter part of 1933. Happily, this better state of things is being steadily maintained. The company's largest subsidiary—the South Wales Power Co.—felt the quickening of the trade pulse, and is well placed to take advantage of the general growth of business. It is almost the common experience for domestic consumption to grow whether or not the industrial load advances, but as Sir Holberry Mensforth suggested at the annual meeting, the industrial improvement with the better employment and freer spending capacity that it brings will give an added impetus to the already automatically growing domestic demand. A point of interest in connection with the S.W. & S. Co. is the fact that its power plant and transmission and distribution systems are of modern design, one-half of the capital expenditure during the last five years having been in respect of these.

Alcoholectrical Development

According to an American contemporary electricity is being used in the United States "by amateur drinkers and liquor houses to age their whiskies quickly to meet the need of the drought that repeal has created." The idea appears to be merely to keep the temperature at 140 deg. for a day or two by means of an immersion heater. This is said to "speed up esterification and produce bouquet and flavor quickly." On this side of the Atlantic we have many amateur electricians who are bad enough already. We tremble to think of the possible results if they become "amateur drinkers" as well and combine the two hobbies.

The Road Transport Outlook

It is not surprising that the general managers of the Brisbane and the Melbourne tramways should have come to substantially similar conclusions as a result of their recent visits to England to study our practice and tendencies in road transport. Mr. G. R. Steer and Mr. A. D. Murdoch agree that the tramways, the trolley-bus and the oil-engine bus have their own spheres, which depend upon local conditions, and consider that it would be economically unsound to scrap the tramways. The question in our view is largely one of traffic density and breadth of streets; where circumstances have justified the scrapping of the permanent way, the trolley bus has been shown to be the most suitable successor to the tramcar. There is also a growing belief that it should have been employed in many cases where the oil-engine bus was too hastily adopted. Recent developments in trolley-bus manufacture have lent considerable support to this view.

Large Electrical Equipment in the Shenley Mental Hospital

1. Lighting in the recreation hall. 2. Dough preparation equipment in the bakery. 3. Washing machines and hydro extractors in the laundry. 4. Boiling tables and 95-kW roasting oven in the main kitchen. 5. The all-electric kitchen in the nurses' home. 6. A multi-roll ironing machine. 7. Ironing operations in the staff laundry. 8. Withdrawing a batch from the 80-kW baking oven

Boiling Water for Domestic Purposes

A comparison of methods

BOILING water, as distinct from "hot" water, is needed for the infusion of tea and coffee, and for various cooking purposes. It may be obtained by means of immersion heaters, self-contained boiling vessels, or hot-plates. The

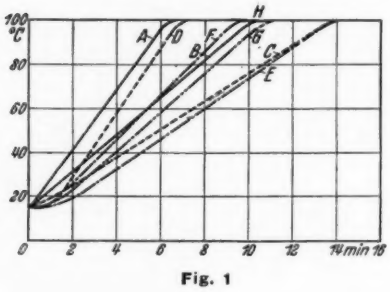


Fig. 1

time required to boil the water and the amount of energy consumed depend on the appliance used and on whether the water is heated from cold or whether water at, say, 185 deg. F. is already available from a thermal storage installation. The accompanying data and diagrams, from an article by Fr. Mörtzsch in *Elektrotechnische Zeitschrift*, show the importance of fully considering these factors.

Where no thermal storage apparatus is available and water has, therefore, to be heated from, say, 15 deg. C. (59 deg. F), the time required to raise 1 litre (1.76 pints) to the boiling point is as shown in fig. 1, the letters *A-H* corresponding to the appliances and conditions noted in table I, which also shows the boiling time and energy consumption for 1.76 pints and 3.52 pints. The most rapid boiling is effected by the 1,000-W immersion heater *A*, the slowest with utensil *C* or the aluminium pan and low-rating hot-plate *E*, starting cold. There is a remarkable difference between the rates of the ordinary and "express" boilers *C*, *D*; and between the times required when starting with a cold-plate *E*, *G* and one hot from previous use *F*, *H*. The energy consumption data

TABLE I.—TIME AND ENERGY CONSUMED IN BOILING WATER.

Ref. (see Figs. 1 and 2).	Appliance and conditions.	From 15 deg. C (59 deg. F.). 1 litre: Time to boil. Min.	1 litre: Wh consumed.	2 litres: Time to boil. Min.	2 litres: Wh consumed.	From 85 deg. C. (185 deg. F.). 1 litre: Time to boil. Min.	1 litre: Wh consumed.
A	Immersion heater 1,000 W, in earthenware pot	6.5	110	12.5	210	—	—
B	Immersion heater 700 W, in earthenware pot	10.5	130	19.5	230	6.8	75
C	1.5 litre (2.64 pint) utensil, 600 W	14.0	150	25.0	250	7.4	80
D	2 litre (3.52 pint) "express" boiler 1,200 W	7.0	150	12.5	260	—	—
E	Aluminium pan 1 litre (1.76 pints) starting on cold plate, 800 W, 5⅛in. dia.	14.0	200	22.5	300	12.7	175
F	Ditto, starting on warm plate ...	9.5	130	15.5	230	6.5	95
G	Aluminium pan 2 litres, starting on cold plate, 1,200 W, 7⅛in. dia.	11.0	230	17.5	350	11.2	220
H	Ditto, starting on warm plate ...	—	—	12.0	240	5.0	100

TABLE II.—TIME AND ENERGY CONSUMPTION WITH IMMERSION HEATERS.

Ref. (see Fig. 3)	Utensil and conditions.	Raising 2 litres of water from 85 deg. to 100 deg. C. Boiling time Min.	Consumption Wh
X	Thin nickelled-brass, covered utensil, with a detachable 1,000-W immersion heater in a well at the bottom	4.5	75
Y	Earthenware jug standing on wood and heated by 1,000-W immersion heater	7.0	120
Z	Aluminium pan standing on iron and heated by 1,000-W immersion heater	13.0	218

show the economy of quick boiling (*A* requires least energy); the wastefulness of starting with a cold, large plate (*G* requires nearly twice as much energy as *A* for 1.76 pints); and the relatively more economical boiling of 2 litres compared with 1 litre.

For the larger quantity of water the "express" boiler is as rapid as, and the preheated 1,200-W hot-plate is slightly more rapid than, the 1,000-W immersion heater, but the latter is still the most economical in energy consumption. The Wh figures in table I show clearly the desirability of using immersion heaters or self-contained boiling utensils in preference to hot-plates for boiling water.

Water from Storage

The use of hot-plates to bring water drawn from a thermal storage up to boiling point is still less advisable, as will be seen from the curves in fig. 2. When an aluminium pan containing water drawn from storage at 85 deg. C. (185 deg. F.) is placed on a cold-plate, the temperature falls to about 70 deg. C. (158 deg. F), as shown by curves *E*, *G*, before the hot-plate becomes effective. The immersion heater *B* shows to best advantage, and the energy consumption is then only about one-third of that required if 1 litre of hot water be put in a 2-litre pan on a cold-plate (case *G*).

The same points are illustrated by the figures in table III, relating to the boiling of 2 litres of water from 85 deg. C., using 1,000 W in each case in order to obtain directly comparable results.

In order to determine the influence of the vessel and the conditions of use on the economy of immersion heaters, tests were made as shown in fig. 3, which also shows temperature-time curves, starting with water at 85 deg. C. Particulars of the equipment are given in table II, and the energy data there cited show the importance of placing the utensil on a wooden table instead of cold iron. Failure to observe this simple precaution may nearly double the energy consumption.

Where circumstances permit, the use of a hot-water storage with a supplementary heating element for the delivery of

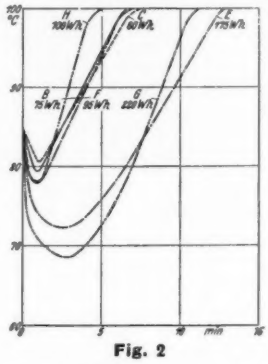


Fig. 2

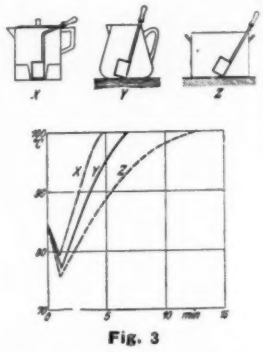


Fig. 3

water at 98-99 deg. C. (208-210 deg. F.) is the most convenient and efficient of all methods. Thus, a geyser-type heater of about 1¼-gal. capacity, as used for sink or basin supply, can

TABLE III.—TIME AND ENERGY CONSUMPTION FOR THREE METHODS.

	Time to boil. Min.	Wh consumed.
Immersion heater in earthenware vessel, 1,000 W ...	7.0	120
"Express" boiler, 2 litres, 1,000 W	6.0	100
Aluminium pan, 2 litres, on 7⅛in. hot-plate at 1,000 W, starting cold	19.5	320

be fitted with a second heating element switched in by hand and cut out thermostatically at 98-99 deg. C. At 98 per cent. thermal efficiency, the energy required to heat 2 litres from 15 deg. to 98 deg. C. (59 deg. to 208 deg. F.) would be: Watt-hours = 36.6 × No. of pints × Tempr. rise (deg. F.)/Efficiency (per cent.) = 36.6 × 3.52 × 149/98 = 196 Wh, which is better than any of the performances mentioned in table I.

Valve Oscillators

THE Dow method of so-called "electron coupling," which by means of multi-grid valves has found an application in superheterodyne receivers for broadcast reception, and a method of applying the principle of the governor, as used in engines, to wireless transmitters, are among many circuit arrangements discussed in Radio Research Special Report No. 13, entitled "Valve Oscillators of Stable Frequency, a Critical Survey of Present Knowledge," issued by the Department of Scientific and Industrial Research (Stationery Office, 1s. net). The survey is in two parts. The first deals with the subject as a whole and constitutes a practical textbook of the fundamental principles of this branch of radio science illustrated by reference to typical circuit arrangements used in practice. The second part consists of abstracts of papers representative of the most important published work on the subject with notes intended to bring each particular contribution into perspective with the whole.

Motor-driven Machine Tools. By W. L. Sims, A.M.I.E.E.

Difficulties due to supply regulations

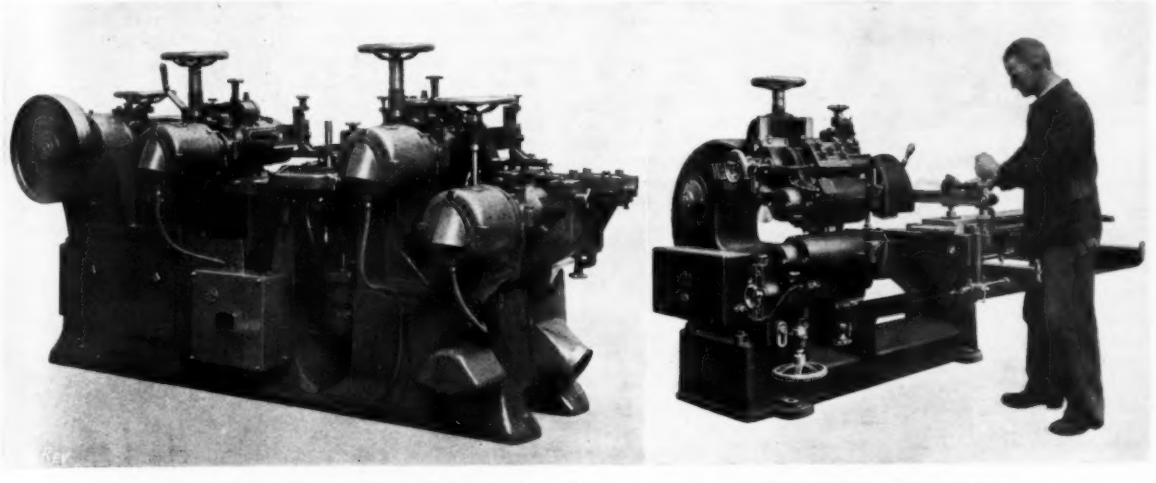
A VERY great impetus has been given to the use of electrically driven machines in recent years, due to the adoption of integral electric drive and control. Machine tools are now designed as electrical machines, as one co-ordinated whole, instead of the machine being separately driven by a motor on the floor, controlled by a starter on an adjacent wall or pillar.

Direct electric driving, which eliminates all transmission methods, *i.e.*, belts, pulleys, gears, chains, etc., is particularly noticeable in modern woodworking machines, perhaps because the higher synchronous speeds possible with induction motors coincide with the working speeds required; thus small compact motors can be used with the cutting tools mounted directly on the motor shafts.

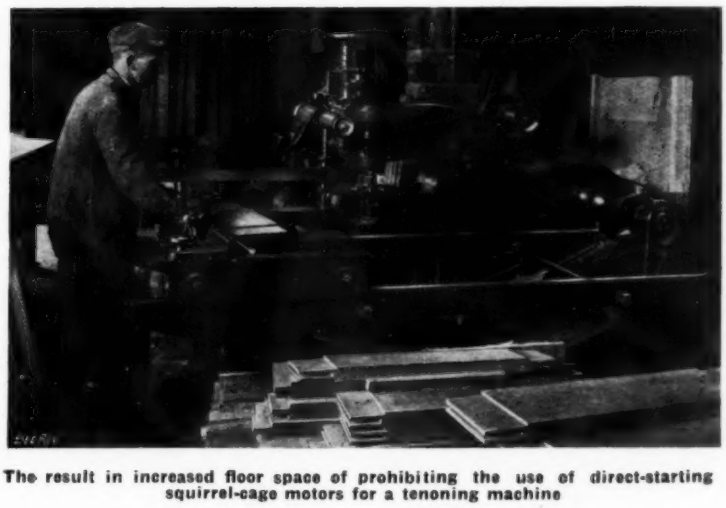
Difficulties of installing such machines are, however, often unwittingly put in the way by many electricity supply authorities, who appear to view with unreasonable alarm the starting currents taken by squirrel-cage motors, particularly when directly connected across the supply lines.

While, of course, it is essential that one consumer shall not cause a heavy momentary drop in voltage in his immediate vicinity, it is unfortunate and obviously illogical to restrict unduly the use of squirrel-cage motors and their direct starting on a basis of the horse-power of each individual motor. Usually several machines are installed and therefore the permissible starting current of each motor should bear a relationship to the total installed horse-power and not to its own horse-power.

It is appreciated that many enlightened supply authorities do view each case on its merits, and that in many areas it is usually permissible to direct start motors up to at least five horse-power and star-delta start squirrel-cage motors up to twenty-five horse-power with correspondingly larger sizes where consumer's installation warrants a separate transformer sub-station.



Left: A five-cutter moulder with six motors. Right: A beltless tenoning machine (five motors)



The result in increased floor space of prohibiting the use of direct-starting squirrel-cage motors for a tenoning machine

Essential Characteristics

Reliability must obviously be an inherent feature of any electrically driven machine, and it is generally acknowledged that the squirrel-cage induction motor with its indestructable rotor and freedom from rubbing contacts (brushes and slip rings or commutator) is the ideal motor for industrial purposes. For woodworking machinery this motor is made in its two essential components, *i.e.*, the rotor and stator, the rotor being mounted directly on the machine spindle and the stator built into the frame of the machine. By this means it is not only possible to apply a motor to each machine, but also a motor to each movement on the machine.

The most simple method of connecting a squirrel-cage induction motor to the supply is by means of a triple-pole switch (assuming a three-phase system of distribution), it being quite unnecessary, so far as the motor is concerned, to limit the current at starting.

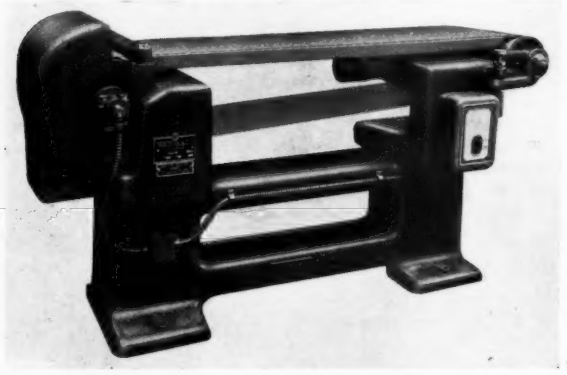
The control of a woodworking machine must be simple and certain because revolving high speed cutters and saws are dangerous, therefore the operator should be able to start and stop his machine in a simple manner, and should under no circumstances have his attention distracted from his work by leaving the machine to go to a starter nearby.

The control gear should also have no-volt release features in order that the gear may open automatically in the event of a supply failure, thus preventing possible accident due to unexpected starting when the supply is resumed. The control gear should also disconnect the motor from the supply in the case of sustained overloads, but the overload device should not operate during short peak currents, due to a knotty or difficult piece of timber, which do not harm the motor.

In addition, the control gear may be required to inch, reverse, or brake the cutter spindle, or movement which it controls, and in the case of machines with several motors it may be necessary to interlock various control units in order to ensure a definite sequence. Also limit switches may be necessary to prevent over-running. Or again, an electrical interlock with a mechanical feature may be required, so that for example if a spindle is mechanically locked for cutter changing purposes it cannot be started in the event of an operator omitting to unlock his spindle. The only type of starter which is capable of completely meeting all the above requirements is the magnetically controlled direct-on contactor, which can be fixed in any convenient position on the machine and can be operated remotely by push-buttons, thus giving the operator electrical control in its most simple form.

Since the closing and continued operation of the contactor

depends on an electro-magnet the gear inherently gives positive no-volt protection, even though the supply dies down slowly. Interlocks, limit switches, overloads, etc., can be readily arranged to open the contactor coil circuit automatically, thus making the machine foolproof.



A belt sander with an external rotor motor

It will thus be appreciated that the two essential features of integral electrically driven woodworking machinery are the squirrel-cage motor and the contactor starter. The limitation of squirrel-cage motors to unreasonably small horse-powers prohibits the use of the unit type of motor and hence the integral electric drive. The only alternative is a motor coupled to a countershaft. Such an arrangement reintroduces belts, takes up about twice as much floor space, is obviously less efficient, and the machine is not so easy to control or to set up as an integral machine. Therefore, considering a plant of machines in the aggregate the maintenance costs go up, the rental charge due to space occupied is increased, the running costs are increased, and the production is reduced.

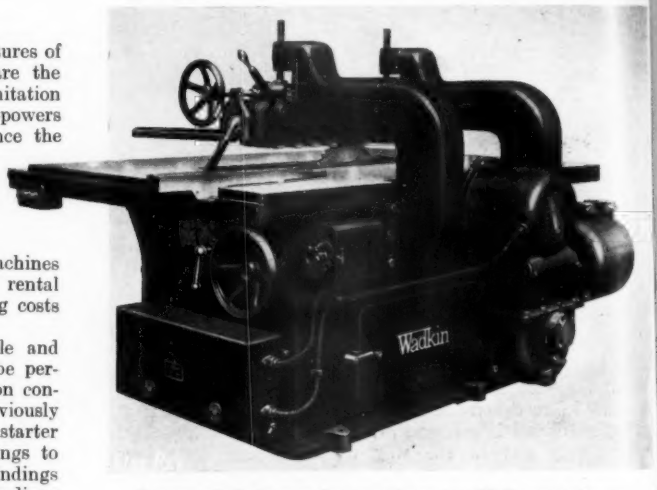
In order to keep control simple and hence reliable and economical, it is essential that direct starting should be permitted as much as possible. Starting current limitation considerably complicates control mechanism. Where previously one contactor was required it is now necessary to use a starter embodying one contactor to connect the motor windings to the supply, a second contactor to connect the motor windings in star, and a third contactor to connect the motor windings in delta, together with a timing device to control the time interval between the opening of the star and closing of the delta contactors.

It will be readily understood that in the case of multi-motor machines star-delta starting panels would be so costly as to rule out the possibility of the machine on economic grounds. For example, a beltless tenoning machine with five built-in motors all push-button controlled would, in the event of straight-on starting being prohibited, require fifteen contactors and five timing devices instead of five contactors. The prohibition of squirrel-cage motors would result in a slip-ring motor being coupled to the countershaft, the starter being on an adjacent fixing; thus additional floor area would be covered by the machine and its countershaft and the belts which become necessary.

For a power-fed rip saw suitable for feed speeds up to 150 ft. per minute, a four-speed change-pole motor can be used instead of a gear box: this type of motor also has an application on multi-speed drills and lathes, the chuck being on the motor shaft end. This type of motor must be direct-on started, and it is essential that the saw and feed be interlocked so that the feed cannot run unless the saw is revolving.

In the case of a five-cutter moulder embodying six motors for planing and moulding timber on all four sides up to 150 ft. per minute, overhung construction enables motors to be disassembled without disturbing bearings or connections, a practice quite impossible with slip-ring motors.

Again, a belt sander is built with an external rotor motor, the stator winding being on the core on the shaft, which is held stationary. The squirrel-cage winding is on the inner periphery of the outer core, which has a pulley-shaped housing carrying the sanding belt. This design is, of course, impossible with a slip-ring motor.



A power fed rip saw for speeds up to 150 ft. per minute

The above few examples of many machines in common use in the woodworking trades serve to show that supply regulations should be modified, where necessary, to meet changing conditions.

Inaccurate Balancing in Three-phase Meters. By G. W. Stubbings, B.Sc.

ONE of the standard tests carried out on a two-element three-phase meter is that to determine that the torque set up per watt in each element is identical. This test is usually made by connecting the two elements with their current coils in series and their voltage coils in parallel, so that, with full rated watts applied to each element, the torques are in opposition. If the torque/watts constants of the two elements are the same, the meter rotor will remain stationary in these conditions, and the two elements are deemed to be in balance.

A standard three-phase meter will rotate continuously with under one per cent. of its rated full load watts, but this is with the assistance of the friction compensation device. If the static frictional torque of the meter be taken as being of the order of one per cent. of the driving torque at full load, the fact that the rotor remains stationary in the balance test does no more than show that the torques set up in the two elements with equal watts do not differ by more than about one per cent. As a lack of balance of this order may be undetected by the ordinary test, the effect of such a lack of balance upon the performance of the meter is worthy of consideration.

Let us assume that the fractional difference between the torques in the two elements is equal to n, and that the meter is adjusted to register without error on a balanced load of unity power factor. In this condition the watts in the two elements are equal, and as the combined torque of these elements is correct, one of them will be fast by a fractional amount $n/2$, and the other element will be slow by the same fraction. If due to the power factor falling below unity, the watts in the two elements become unequal, the total torque developed will be $(1+n/2)W_1+(1-n/2)W_2=W_1+W_2+n/2(W_1-W_2)$, where W_1 and W_2 are respectively the watts in the two elements. It is therefore evident that the meter will be in error by an amount equal to $n(W_1-W_2)/2$. If the load which the meter is measuring is balanced, then W_1-W_2 is known to be equal to $X/\sqrt{3}$, where X is the total reactive VA, and the error of registration due to the lack of balance is equal to $nX/2\sqrt{3}$. The fractional error is therefore $(n/2\sqrt{3})\tan\phi$. The error due to defective balance is thus of the same kind as that due to phase error, and gives rise, with a balanced load, to a percentage error which depends upon the power factor. If we assume that, with equal watts, the torques set up in the two elements differ by 1 per cent., then with a power factor of 0.5, when $\tan\phi=\sqrt{3}$, the percentage error due to this defective balance is seen to be 0.5 per cent., the sense of this error depending, of course, upon whether the leading or the lagging element is the stronger.

The above result is not strictly applicable to conditions in which the load is unbalanced, since the reactive VA is no longer equal to $\sqrt{3}(W_1-W_2)$. Provided the load unbalance is small, however, the result obtained is approximately true.

The fact that the error due to defective balance is of the same nature as that due to inaccurate phase compensation suggests that intentional lack of balance might be used to give phase compensation in some circumstances. The usual method of phase compensation, while being quite satisfactory for 50 cycle meters, is not quite so good for meters intended for non-standard low frequencies. By making the leading element of a three-phase meter relatively weaker than the lagging element a virtual phase compensation would be obtained which would be quite satisfactory for balanced loads, and which, moreover, would be independent of temperature changes.

Transformer Protection. By W. Woodiwiss, A.M.I.E.E.

Ascertaining the connections for Merz-Price gear

A KNOWLEDGE of the diagram of connections for transformer protection on the Merz-Price system (in which under normal conditions balanced currents circulate in the current transformer secondary circuits) needs to be supplemented when installing the gear and deciding the manner of making the secondary circuit connections, as incorrect connections would result in out-of-balance currents tripping a healthy transformer on load.

Mr. W. Woodiwiss

The problem also illustrates the interpretation of vector diagrams with reference to the specific circuits to which they are related. Referring to the circuit diagram in fig. 1, the problem that arises is to determine how the current transformer secondaries a_s, b_s, c_s, must be connected to the terminals 1, 2, 3, so that the resultant currents are in phase with the currents from P_s, R_s, Q_s, in order to obtain the correct relationships.

The problem is one of phase relationships and the following factors are involved:—(1) the polarity of the main power transformer; (2) the method of making the main power transformer primary delta connection; (3) the method of making the delta connections of the current transformers c_s, b_s, a_s. In order to apply the theory the current transformers must have each end of their primaries marked with the appropriate M and L marking, and the secondary terminals marked with their corresponding (M) (L) markings; when primary current flows from M to L, secondary current flows from (M) to (L) *in the external circuit*.

The transformer manufacturers come to our assistance as regards the main power transformer connections and polarity. Their vector diagram of voltages induced in the transformer windings (fig. 2) takes these factors into account. On the high voltage side A, B, C, represent the pressures induced in the appropriate transformer phase windings. H.v. terminal P is joined to the junction of windings B and C; terminal R to the junction of windings B and A, terminal Q to the junction of windings A and C. The arrows in the diagram indicate the direction of induced pressures in the windings.

Main current vectors

The low-voltage winding pressures are represented by a_s, b_s, c_s. These are in phase—or phase opposition depending on the polarity of the transformer—with A, B, and C, since the corresponding windings are on the same transformer core limb and so are linked with the same flux. Fig. 3 shows the pressures A′, B′, C′, applied to the h.v. windings; these are in phase opposition to the induced pressures A, B, C, of fig. 2.

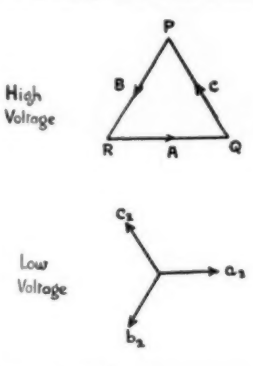


Fig. 2.—Induced pressures: transformer vector diagram

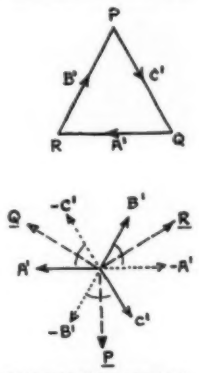


Fig. 3.—H.v. winding applied pressures and h.v. currents

If a load on the transformer of unity power factor is assumed, the voltage vectors may also represent current vectors. The delta current vectors show that in the h.v. windings A, B, and C currents are flowing respectively from terminals Q to R, R to P, P to Q. The inflowing currents at terminals P, Q, R are C′−B′, A′−C′, B′−A′. To express these line currents by a rotating vector diagram draw the pressure vectors A′, B′, C′, in phase opposition to pressure vectors a_s, b_s, c_s. Then, since unity power factor is assumed, these represent current vectors, and by taking the above vector differences the line currents are given in this diagram by P, Q, and R.

The phase relations of the main circuit currents being now ascertained, the most interesting part of the problem is reached. It is now that the reasoning must proceed from the circuit diagram to the vector diagram and from the vector diagram back to the circuit diagram. In fig. 1 is shown the main transformer with its h.p. lines P, Q, R, and l.p. lines a_s, b_s, c_s. In each line is shown the Merz-Price current transformer primary with its terminal markings M and L. The arrows indicate that in lines P, Q, R, a three-phase current is flowing into the transformer on the high-voltage side and that a three-phase low-voltage current is flowing out of the transformer on the low-voltage side.

The secondaries of the current transformers are now drawn adjacent to their primaries and it is necessary that these have their (M) and (L) markings. The secondaries P_s, R_s, Q_s, are star connected on their (L) side and are joined respectively to terminals 1, 2, and 3 on their (M) side. Remembering now that current flows from (M) to (L) in the secondary circuit when the primary current flows from M to L, and observing in the circuits diagram that all primary currents are from M to L, the arrows for the direction of the three-phase current flow can be inserted in the diagram of the secondary circuits.

It is evident that when a three-phase current flows into the high-voltage side of the transformer, a three-phase current flows from the secondaries P_s, R_s, Q_s to terminals 1, 2 and 3; that is the primary and secondary three-phase currents are relatively unidirectional. Hence, if vectors P, Q, R represent what in the diagram might be termed a down-flowing three-phase current the vectors of the secondary down-flowing three-phase current may be represented by vectors (1)P_s, (2)R_s, (3)Q_s. Similarly, if the down-flowing low-voltage primary current is represented by vectors a_s, b_s, c_s, the down-flowing secondary three-phase current is represented by vectors a_s, b_s, c_s.

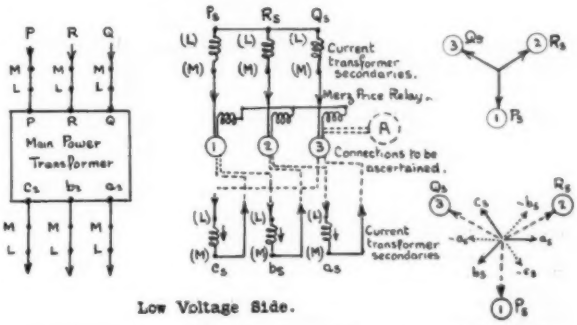


Fig. 1.—Connection of secondary circuits

Thus from a consideration of the circuit diagram the secondary-circuit vector diagrams have been deduced. It now remains to utilise these vector diagrams to ascertain the circuit connections. Superpose the vectors (1)Ps, (2)Rs, (3) Qs on the vectors a_s, b_s, c_s, maintaining, of course, the correct phase relationship between the two sets. From b_s-c_s is obtained current (1)Ps; from a_s-b_s a current (2)Rs is obtained; from c_s-a_s a current (3)Qs is obtained. Translating this into practice means that to obtain an inflowing current into the delta, (1)Ps in phase with the current from P_s, b (L) and c (M) must be joined to terminal (1).

Similarly, *a* (L) and *b* (M) joined to terminal 2 give an inflowing current (2)Rs in phase with the current from Rs: *c* (L) and *a* (M) joined to terminal 3 give an inflowing current Qs in phase with the inflowing current from Qs. Hence the dotted delta connections of the circuit diagram give the required current balance in the secondary circuits.

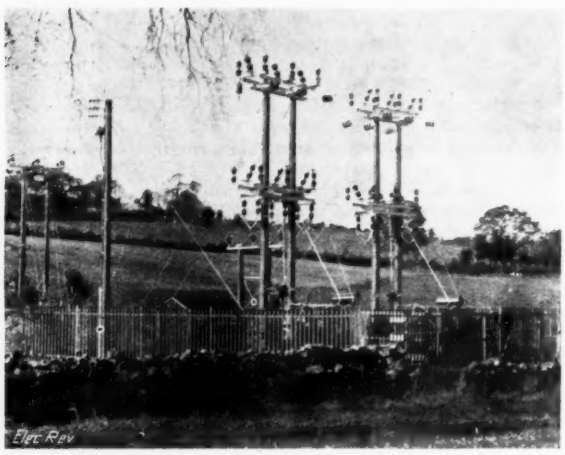
In practice, as a final precaution, the correctness of the connections would be checked by placing a suitable ammeter in the relay circuit. If as the load increases the ammeter indicates an increasing current through the relay, the con-

Development in Northern Ireland. By R. N. Tweedy

Rapid progress in less than two years

NO more opportune moment could have been chosen for disclosing the very remarkable record of progress which formed the subject of a paper read by Messrs. C. R. Westlake (chief engineer and manager of the Northern Ireland Electricity Board) and D. P. Sayers (Messrs. Kennedy & Jenkin) before the Institution of Civil Engineers of Ireland in Dublin recently, because it followed immediately upon the publication of the 1932-33 report of the Electricity Supply Board of the I.F.S. and provided interesting contrasts and comparisons.

Trading operations began on June 1st, 1932, by the acquisition of the undertakings at Bangor, Lurgan, Holywood and



Sub-station and h.p. junction point, Magheralave

Armagh, and since then numerous local systems have been acquired or constructed, and linked up with the 33-kV and 11-kV networks. The remarkable growth of this public utility in rather less than two years is shown in the following table :—

	1932.	1933.	% Increase.
KWh bought	2,680,000	7,800,000	191
KWh generated	688,000	919,000	34
Max. demand, kW	1,763	4,008	131
Consumers	3,666	8,186	123
Applications for assisted wiring ...	99	1,581	1,497
L.v. networks in commission	11	35	218
Undertakings acquired	8	13	62
Undertakings to be acquired	—	13	—
Showrooms	4	5	25

It is thought that the 1933-34 results will show that development is already ten years ahead of the original estimates. Bulk supply comes from the Belfast Corporation station, the cost in 1933 being £3 15s. per kVA, plus 0.149d. per kWh, with a coal clause. In order to reduce conversion losses all heavy loads are supplied by direct transformation from the 33-kV system.

In the neighbourhood of all large villages and towns the transmission lines have been laid out to provide a ring main on which pole-mounted transformers are placed at road crossings to feed into the centre along the main roads. This is a departure from the conventional practice of providing a main supply at the centre feeding outwards, thus economising l.v. copper and improving regulation.

An experimental twenty-five miles of reinforced concrete pole main transmission is under construction. The first cost may be a little higher than for wood poles, but local labour has been employed, and maintenance is expected to be low. Transport of these heavy poles requires proper equipment and skilled supervision, but no great difficulties have been experienced either in transport or erection.

For short spur lines feeding mills and villages 7/12 s.w.g. galvanised steel conductors are tapped off the main s.c.a. lines, saving about £100 per mile. A short experimental length of 0.03 sq. in. segmental steel-cored aluminium is under construction as a medium-capacity line. L.v. distribution is by copper on creosoted wood poles, the smallest conductor being 0.058 sq. in., but the majority are 0.1 sq. in. to avoid early troubles with voltage drop.

In many of the larger villages a system of under-eaves wiring, or surface distribution, is used extensively, a special grade of p.b.j. single-core wire on porcelain cleats being employed. This system is welcomed by the people as an attractive alternative to pole lines, underground cables being out of the question in such districts.

Every inducement is given to domestic consumers to use the two-part tariff, which is common to the whole area. Apart from the personal enthusiasm of Mr. Westlake and his staff, the immediate success of this undertaking serving an area populated at the low density of 250 per sq. mile, must have depended almost entirely on the tariffs offered, so they are worth quoting in part.

Two-part Domestic Tariff:—
(*a*) Unit charge of ¾d. for first 2,000 p.a.; unit charge of ½d. for additional.
(*b*) Fixed charge based on contained area (minimum £1 11s. 3d. for 500 sq. ft.) from ¾d. to 0.4d. per sq. ft. for 6,000 sq. ft. and over.

Two-part Power Tariff:—
(*a*) 9s. per kVA per month for first 50 kVA; 6s. per kVA per month for additional kVA.
(*b*) Unit charge, ½d.

Water Heating (flat rate):—
(*a*) Night use, ¼d.
(*b*) Unrestricted, ¾d.

Space Heating (long hour), ¾d.

The hire and hire-purchase rates are most reasonable, and are proving attractive to the cottager. For instance, cookers (including an electric kettle and stewpan) cost from 4s. to 12s. per quarter, and "cottage equipments," comprising a hot-plate, radiator, kettle, iron and stewpan, cost 2s. per quarter. The hire of refrigerators is not considered to be good business on account of the high ratio of capital cost to energy used.

Replying to a suggestion that the high rate of growth in the second year was due to "ready-made" undertakings coming into the statistics, Mr. Westlake gave examples of the sudden development of such undertakings one year after absorption, *e.g.*, Armagh 173 per cent., Bangor 95.4 per cent., Holywood 76 per cent., and Lurgan 65 per cent., proving

A steel-tower h.p. line at Castlereagh, Belfast

convincingly his opening statement that lighting was the principal purpose served by these isolated concerns, and in many cases even that service was rendered indifferently.

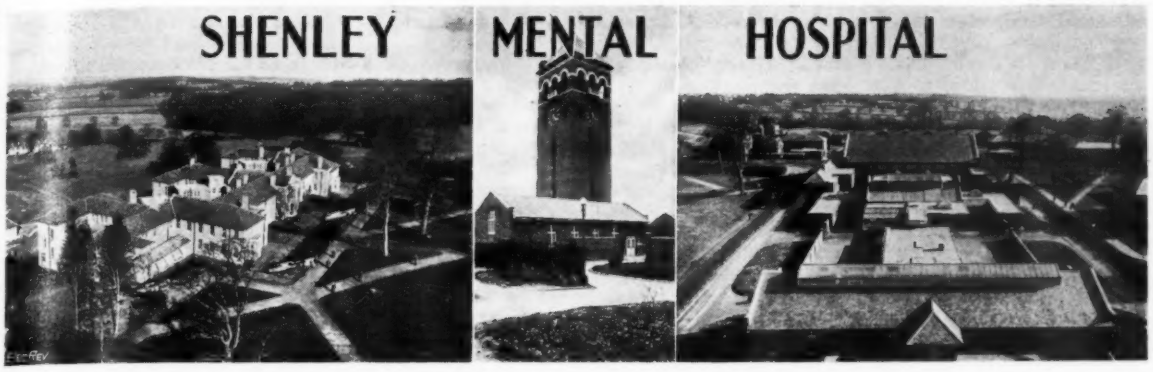
"Electricity," as Mr. Westlake said, "turns domestic bondage into liberty," and it will not be his fault if there are any domestic serfs in the six counties of Northern Ireland in ten years' time.

Transformer Protection (*continued from the previous page*)

nections are either incorrectly made and need to be checked, or the lack of balance may be due to a slack or broken secondary connection. For correct connections, the ammeter will give a zero reading for any balanced load on the transformer.

It now remains to make the following tests on the gear. The transformer is switched on in parallel with a neighbouring transformer taking load. On the relay are three push knobs for closing the relay trip circuit by hand. A push on any knob should trip the transformer high- and low-voltage switches. In each of the three secondary circulating current lines is a fuse. If any of these fuses is drawn the secondary circuit current balance is disturbed, and, if the load is large enough, the relay should operate, close the trip circuit, and trip the transformer switches. If these tests prove satisfactory, the gear is satisfactory, and may be put into commission.

SHENLEY MENTAL HOSPITAL



With one exception, space heating, electricity provides all the major services at the new Shenley Mental Hospital of the Middlesex County Council to meet the requirements of 2,000 patients and 500 staff members, and in the following notes and illustrations we have endeavoured to convey an impression of some particularly good examples of utility equipment.

For the laundry and space-heating requirements there is an extensive boiler installation, and, in spite of this, with a few minor exceptions, the whole of the cooking equipment is electric. What is more, the staff is electrically minded, for in the kitchens, the laundry and in the bakery we had a word with many who spoke enthusiastically about the electrical equipment which they had under their care.

Kitchen Equipment

Of outstanding interest in the kitchen is a double-deck drawplate oven of the type usually employed for bread baking, supplied by Messrs. Baker, Perkins, Ltd. It is used for roasting joints, &c., and has a total loading of 95 kW balanced over the three phases. The elements are arranged under and over the drawplates, which measure 12 ft. 9 in. by 6 ft. each, and are mounted on a telescopic carriage running on special steel-ball races.

The remaining equipment in the main kitchen was all supplied by Messrs. Benham & Sons, Ltd., and includes two 24-kW fish fryers, each with three removable mild-steel pans (24 in. by 18 in. by 6 in. deep); three boiling tables, each 8 ft. 6 in. by 3 ft. 2 in. wide, two with twelve solid enclosed hot-plates, totalling 26.4 kW, and one with four hot-plates totalling 22 kW, a single griller and toaster, 24 in. wide, on cantilever supports and loaded at 4.5 kW; a double griller and toaster 18 in. wide, and with a total loading of 7 kW; and an elevated three-oven range, each oven measuring 22 in. by 22 in. by 24 in. high, and having a total loading of 16.5 kW. All the above equipments are controlled by three-heat switches, fuses and pilot lights in separate metal housings.

Household cooker and water-heater in one of the ward kitchens

For ventilating the kitchen there is a system of galvanised ductwork in which are installed two centrifugal cased fans, each capable of removing 2,500 cu. ft. per minute, coupled to two 5-h.p. motors. Power machines in the kitchen include a "Peerless" potato peeler, a vegetable cutter, and pastry mixing, meat mincing and cutting, and meat slicing equipment.

The nurses' home has its own entirely self-contained kitchen, again all-electric, and the equipment, also Benham's, is as follows: an elevated two-oven range, each oven measuring 22 in. by 22 in. by 29 in. high, with a total loading of 11 kW; a fish fryer with two removable pans, each 18 in. by 18 in. by 6 in. deep, fitted with a fume hood, draining trays and baskets, and loaded at 12 kW; a single 18 in. griller and toaster on high legs (3.5 kW); a boiling table, 3 ft. 2 in. by 3 ft., fitted with four solid enclosed hot-plates, totalling 8.8 kW; a 6 ft. by 2 ft. 6 in. hot closet, fitted with sliding doors, loaded at 5.5 kW; a 3.5 kW hot closet; a wet steam oven, 18 in. by 24 in. by 24 in. deep inside, heated by immersion elements (8 kW total); a ten-gallon vegetable boiler, loaded at 5 kW; four six-gallon water boilers, each heated by 4 kW of immersion heaters; two four-pint kettles; and a 1,750-W boiling plate. A "Peerless" potato peeler and a pastry mixing machine are among the power equipment in this kitchen.

In each of the twenty-seven ward kitchens there are a "Revo" household cooker and a six-gal. urn-type hot-water boiler of the same company's make.

The Bakery

From a sifter suspended under the flour loft over the bakery entrance, flour is worm-conveyed to a chute over the kneading machine. The sifter and conveyor are chain driven from a 3-h.p. Brittain motor, with star-delta control.

The kneader has a heavy cast-iron sole plate and separate back and side frames with gunmetal bearings carrying the main drive gear wheels with helical teeth, the whole being totally enclosed. The mixing arm is driven by a 3-h.p. motor housed in the base of the back frame and protected by steel cover plates. The motor is star-delta controlled from the wall.

A dough divider of the two-pocket type delivers twenty-eight to forty pieces per minute on to a conveyor belt which carries the dough to a handing-up machine, where it receives the necessary rolling and cross rolling. The divider and hander-up are driven by a 6-h.p. motor. A machine for preparing mixes for cakes, &c., has a capacity of two cwt.; it is fitted with two-speed gear and is driven by a 3-h.p. motor chain-driven through a dog clutch fitted with interlocking gear.

For preparing batters and beating eggs, &c., a four-speed cake machine and egg whisk has sliding gear transmission, and is driven by a specially designed 2-h.p. B.T.H. motor operated by a remote start and stop push-button switch connected to a B.T.H. contactor panel. The commodities manufactured by this apparatus are cooked in a Baker Perkins two-deck drawplate oven similar to that in the main kitchen, except that the draw-plate dimensions are 10 ft. 9 in. by 5 ft. 9 in., and the total loading is 80 kW.

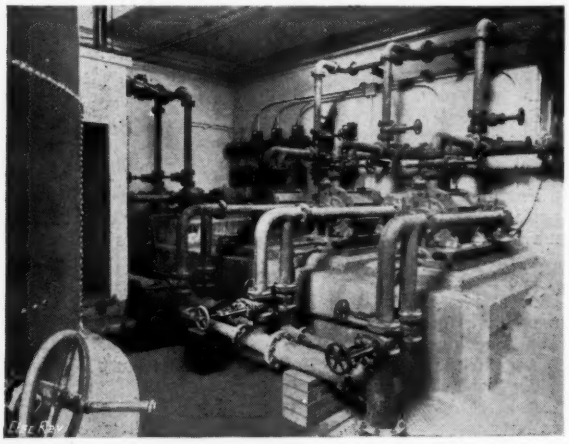
Refrigerating plant at Shenley cools a bacon store of about 740 cu. ft. to 40 deg. F., a fishroom of about 750 cu. ft. to 32 deg. F., a frozen-meat store of about 2,000 cu. ft. to 20 deg. F., and a butter and cheese store (980 cu. ft.), a milk store (940 cu. ft.), and a cooked-meat store (940 cu. ft.) each to 40 deg. F.

The equipment was supplied by J. & E. Hall, Ltd., and consists of a twin-cylinder "Wembley" ammonia compressor with a "Texrope" drive from a 6½-b.h.p. enclosed ventilated motor (1,460 r.p.m.) controlled from a contactor panel. The frozen-meat room is cooled by direct expansion grids arranged on the roof, and the other rooms by grid-type coolers of the "dry" type, using brine, aided by 240-V, single-phase propeller-type fans. Automatic control of the main compressor motor is effected by two thermostats, one in the brine tank and the other in the frozen-meat store, coupled in parallel.

Additional thermostats in the cold stores control the main brine pump, the fans and an electrically operated brine valve in the brine inlet pipe to each room. A high pressure cut-out switch is provided to shut down the plant in the event of excessive condenser pressure.

In the main laundry six washing machines are arranged in two groups of three, each group being driven from shafting, served by a 7½-h.p. motor. Some of these machines have a loading capacity of 192 lb. of dry goods each, and others will hold 124 lb. There are also four 36-in. hydro extractors, each having a loading capacity of 90 lb. of dry work, and a 6-h.p. motor drive. The machines are electrically interlocked, so that the guard on the top of the outer casing and forming the lid of the machine is automatically locked until the rotation of the cage ceases when the lock releases itself. Similarly, the machine cannot be started up to work until the lid has been closed and automatically relocked.

An eight-roll ironing machine is driven by a directly coupled 6-h.p. motor through a friction clutch, and is stopped and started by the safety finger guard. This machine will dry



Pumping plant in the water-softening house for delivery to tower

and finish about 300 sheets per hour. The continuous drying machines are 20 ft. long and 10 ft. wide, and each is served by a 4-h.p. motor. Each machine will dry about 150 lb. of dry goods per hour. In the foul linen and officers' laundries there is similar equipment, but the machines are smaller.

X-ray and Dental Apparatus

Up-to-date X-ray equipment, which is to be provided by Messrs. A. E. Dean & Co., includes a valve rectified high-pressure transformer unit, capable of taking X-ray photographs of all parts of the body in fractions of a second, which will be used in conjunction with a radiographic couch in which is incorporated a Potter Bucky diaphragm, thus enabling the very finest radiograms to be taken of barium meals, gall-bladder, lateral spine, &c. A vertical screening stand (diascope) is also to be installed for vertically screening the heart or the alimentary tract. Another room is being equipped by the same company with equipment for artificial sunlight treatment.

In the dentistry department we saw a "Rathbone" dental unit, supplied by Dental Manufacturing Co., Ltd., which is truly all-electric, for it is equipped with an electric engine with four speeds in both forward and reverse, a motor fan which is adjustable in all directions, an adjustable spotlight with narrow beam projection, a four-point overhead lighting unit which radiates a direct but diffused light comparatively free from shadows, a bracket table with a drawer which accommodates low-voltage instruments, the leads of which are wound and unwound and locked electrically, an X-ray film illumination, a motor-driven air compressor, and electric mouth lamps.

Throughout the buildings there are twenty 2-cwt. electric service lifts supplied by Pickerings, Ltd. Each lift is driven by a 1-b.h.p. s.c. motor with push-button control, and "Yale" type locks are fitted to all the push-buttons to prevent their operation by unauthorised persons.

For the entertainment of the patients by radio there is a central receiving station which provides the input to a bank of power amplifiers from which, at the present time, 100 loud speakers are operating. In the theatre is a 25-W Model 610B equipment fitted with microphone and microphone amplifier, and arrangements have been made for the microphone output to be fed into the central amplifier bank mentioned, so that a performance can be broadcast throughout the hospital. Standard radiograms are installed in some of the medical officers' quarters and in the nurses' home to afford independent reception. The foregoing is "Marconiphone" equipment.

The automatic telephone equipment supplied by Ericsson Telephones, Ltd., includes a switchboard with two 100-line bays carrying initial equipment for 140 lines and fifteen connecting circuits. The board employs a three-digit numbering scheme throughout, and by means of the 100-line units the board is extensible to a maximum of 1,000 lines.

A combined main frame and intermediate distribution frame is fitted, thus providing a central termination point for incoming cables, and also a means of protecting exchange apparatus. A comprehensive alarm scheme can be extended as desired to a position remote from the exchange, and a small portable tester allows quick routine switching to be made. The exchange is served by duplicate 50-V 200-Ah batteries which are charged by a three-phase motor generator. All the multiple cables are terminated in standard cast-iron test boxes, and 12,500 soldered connections were made at the test boxes and on the line side of the main frame.

Interior and Exterior Lighting

Some of the lighting at Shenley calls for special mention. For instance, that in the recreation room has been carried out by twenty Holophane "Hedralite" fittings fixed flush with the ceiling in the form of panels.

The fittings are octagonal in shape, measuring about 3 ft. across the flats and projecting one foot from the ceiling. The upper vertical tier is glazed with amber-tinted glass panels, and the surrounding ceiling panels have been tinted to match, giving a very fine colour scheme to the hall. They are arranged in two rows of seven in the sloping sides of the ceiling, while there are three sets of two each down the centre. Each fitting is equipped with four concentrating reflector units and 200-W lamps recessed above the ceiling level. The illumination results are remarkably even, with an average intensity of 8 ft.-candles.

Stage lighting equipment, manufactured by the Strand Electric & Engineering Co., Ltd., consists of "Sunray" magazine type battens and footlights embodying a three-colour lighting scheme. Special proscenium lighting is also being provided, this being controlled from the stage switch, fuse and dimmer regulator.

The Club Room has a much lower ceiling, formed with rectangular-shaped panels with deep dividing beams. At each side are five rectangular "Hedralite" fittings each equipped with two 40-W lamps, fitted flush with the ceiling, whilst down the centre and in the larger panels are three octagonal drum-type similar fittings, each equipped with four 75-W lamps. The illumination in this room is about 3.5 ft.-candles.

The roads and immediate areas flanking the buildings are illuminated by 12-in. opal spherical fittings mounted on "Paisley" standards, all supplied by the Revo Electric Co., Ltd. Of the 100 Smith's Electric synchronous clocks installed throughout the buildings, those in the larger blocks are arranged on a separate circuit direct from the switch room. At the tower top there are three synchronous clocks with 10-ft. dials supplied by Messrs. Gillett & Johnson, Ltd.

Water Supply

In a well at a depth of 150 ft. there are two Worthington Simpson pumps, driven by E.C.C. 30-h.p. vertical s.r. three-phase motors at ground level. The motors are remotely push-button and contactor controlled from the water-softening house, 350 yards distant, or at the pump house, and the switchgear for this control was supplied by the Electrical Apparatus Co. Ltd. The pumps deliver to a reservoir against a total head of about 90 ft., and the water from the reservoir is again pumped to a tower.

As a precaution against supply failure there is to be installed a stand-by plant by Crossley Bros., Ltd. This consists of a 250-b.h.p. 500-r.p.m. compressorless, five-cylinder, four-cycle, single-acting, trunk-piston engine, directly coupled to a 168-kW three-phase, 415-V, 50-cycle Crompton-Parkinson alternator. The equipment is completed by an automatic voltage regulator and the main control panel.

Air-break Switch Specifications

THE new editions of the British Standard Specifications for air-break 660-V knife switches and isolating switches, open and enclosed types (Nos. 109 and 124 respectively), differ in several respects from the 1933 editions, mainly as regards the voltage ratings and the breaking-capacity test. The standard current ratings have also been amended with a view to obtaining a standard series of ratings for all types of switches and circuit-breakers. The Specifications include clauses dealing with rating, design and construction, temperature limits and tests, and an appendix gives notes on the precautions necessary when carrying out temperature measurements by the several recommended methods. Copies of these revised Specifications may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. each post free.

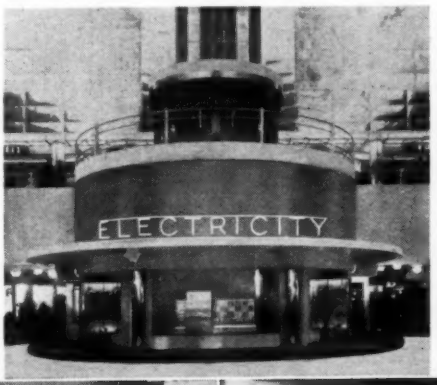
The Ideal Home Exhibition

Impressions of the electrical exhibits

PLEASING in themselves, the electrical exhibits at this year's Ideal Home Exhibition are disappointing as a whole, for fourteen or so "official" exhibitors cannot be considered as representative of the domestic section of the electrical manufacturing industry.

Although there are some newcomers, a few notable exhibitors of previous years are absent this time; and generally the electrical goods displayed are much too scattered throughout the whole show. With three exceptions—lighting equipment, refrigerators and vacuum cleaners—no one class of equipment is represented sufficiently to indicate development.

For a true perspective of lighting development, however, one has to search all sections of the exhibition. Some of the lighting displays are notable. For instance, all manner of attractive fittings are made up of varied combinations of "Neolux" tubular lamps (40- or 60-W standard), while it is hard to imagine that in "Neolux" facet fittings of the same manufacture (Messrs. L. Dernier & Hamlyn, Ltd.) there is not something to suit every taste. The "Rodo" lamp displayed by the British Thomson-Houston Co., Ltd., is a tubular unit made in lengths up to 4 ft. Straight, curved and angle shapes in opal or colour sprayed can be supplied, and with the end to end filament and side contacts the lamps may be employed to give a continuous line of light. The "Mazda" sun lamp, in conjunction with B.T.-H. sun-lamp equipment, affords effective and safe home ultra-violet treatment.



seven models in sizes from 5 to 60 cu. ft., and there is also a 5 cu. ft. "built-in" model. Electrolux, Ltd., also have a "built-in" model of 1 cu. ft. capacity. Higher legs and pleasing front ornamentations are points worth mentioning about some of the Marco equipment.

We were told that the combination cooker and refrigerator produced by Pressed Steel Co., Ltd., has been well received. "Grunow" refrigerators displayed by Rotapex, Ltd., have removable shelves in the evaporator unit, and a foot-release pedal for the door, and it was stressed that the mechanical unit operates on vacuum only.

As is the case with the Westinghouse refrigerators produced by the Lightfoot Refrigeration Co., Ltd., a choice of two exterior finishes, porcelain or lacquer, is often given. The new "H.M.V." refrigerators (described on page 492 of this issue) have made their first public appearance.

Another encroachment from the world of music is the equipment shown by the Decca Record Co., Ltd., who are also producing cookers, fires, and small appliances.

Many vacuum cleaner improvements may be seen among the equipment displayed by the Edison Swan Co., Ltd., the Hotpoint Electric Appliance Co., Ltd., the General Electric Co., Ltd., British National Electrics, Ltd., Rotapex, Ltd., Hoover, Ltd., Electrolux, Ltd., Vac-Tric, Ltd., British Electric Domestic Appliances, Ltd., the British Vacuum Cleaner & Engineering Co., Ltd., Newmode

Three views of the stand of the British Electrical Development Association

The "Mekelite" domestic lamp displayed by Mek-Elek Engineering, Ltd., is designed particularly for close-up use such as needlework and reading. The slender reflector shields the eyes and focuses the light, and the arm which swings readily into any desired position is carried on a vertical pillar pivoted in a substantial base. For delicate glassware one might imagine that some of the fittings shown by Messrs. Hailwood & Ackroyd, Ltd., are the last word. But most of the displays in the electrical section include excellent examples of lighting equipment.

Refrigerator Progress

Most of the improvements we saw in refrigerator equipment are points of refinement, and obviously the "drawing-room" finishes for kitchen equipment are keeping the prices high in many cases. Some of the new features pertaining to the Frigidaire cabinets are interior lighting, larger hydrator space for moist storage, increased ice-making capacity, cam handles on the ice trays for unsticking when removing, and automatic defrosting (automatic switching on after defrosting). The International Refrigerator Co., Ltd., seemed pleased to be able to report that more B.T.-H. models are now being made at Rugby; the change-over from American to English manufacture has occasioned practically no change in construction.

Interior lighting, foot-pedal opening of the door, and a door on the freezing unit are some of the new points about the Kelvinator equipment. The "Vactric" refrigerator is now in the hands of Coldair, Ltd., who have extended the range to

Electric Appliances, Ltd., and Tellus Super Vacuum Cleaner, Ltd.

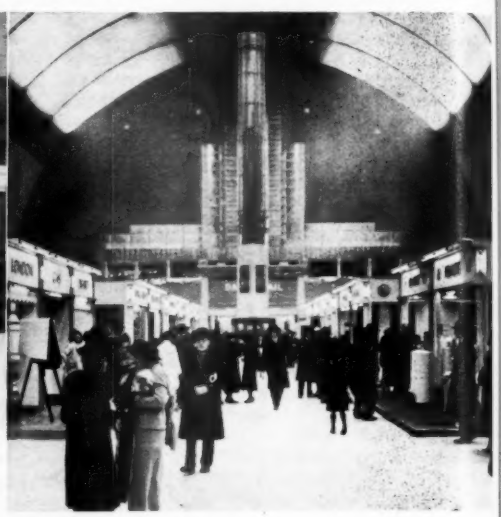
Among the very little cooking equipment displayed we saw improvements in "Magnet" equipment and a "Hotpoint" cooker. The G.E.C. features are a redesigned boiler-griller from which the element units can be removed by taking out only one screw which holds a cast end plate over the terminal components and the end of the withdrawable underslung grid; the splash-plate can be lifted off its supporting brackets, which are so shaped that the hob may be lifted up without having to alter the position of the cooker; the hob units and the oven element bars (450 W) are interchangeable for all three "Home" models. On the Hotpoint "Utility" cooker the new "Torribar" boiling plate has its inside coil full on at medium switching, making, in effect, a smaller plate.

A new 600-W chromium-plated turnover table toaster is shown by this company, while a new safety kettle of the same make has a throw-out connector. We saw a "Magnet" kettle with an element clamped to the bottom from projections inside the rim extending beneath the bottom of the kettle. An appliance connector made by the G.E.C. has floating terminals for different centres. Rotapex, Ltd., are showing glass coffee percolators in which the percolator proper rests on a specially designed two-heat hotplate (660 W and 80 W).

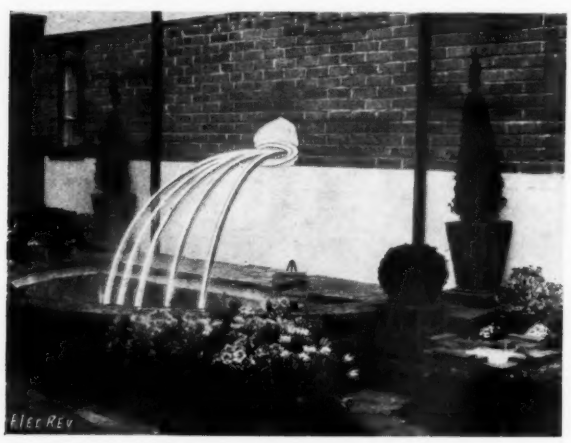
Belling & Co., Berry's Electric, Ltd., Bratt Colbran Co., Ltd., A. Bell & Co., Ltd., and other manufacturers, all spoke of increased business in inset fires; one manufacturer went so far as to say that because of likely intensive development

arising from increased building the portable fire development would be definitely and permanently arrested. We were told by one maker that the combined coal and electric fire "does not go," but newcomers with this class of equipment are Cakebread, Robey & Co., Ltd. The only convector heater that we saw is a model displayed by Bratt Colbran, Ltd., but this is merely a further addition to the recent introductions in this class of equipment.

Improvements in the "Ediswan" low-temperature equipment are brackets from which the tubes lift out and are held in by grub screws, and skirting heater covers which merely "hook on" at the top to the completely assembled back. Newcomers to the domestic field, but by no means to the electrical world, are Messrs. Bertram Thomas, who are introducing "Tunnel" l.t. heaters which are made with loadings of 60, 120, 180 and 240 W per foot run in one steel housing in each case, the exterior surface being increased with proportionate loading increase. The casing is of light metal and in two pieces, with a slip-on engagement, and the heaters proper have resistor spirals threaded through porcelains which register firmly with turned-up projections from metal channelling. Another development by this company is service table equipment, of which there are two classes. One is a trolley with a hotplate measuring 2 ft. by 15 in., with three heats (500 W maximum). The aluminium plate has a corrugated top surface, and it lifts out of a metal angle supporting frame which is carried by the wooden legs. For utensils three plug and socket outlets are fitted as standard, in addition to the plug and socket inlet. An additional fitting is a spot light with a flexible tube support at one corner of the equipment for use when carving. A service table with a warming cupboard is of similar construction, but with a second hotplate at the bottom, and the space between the two plates is filled in with glass panels and doors.



Left: The exhibit of the General Post Office, in which a variety of services is demonstrated. Right: The huge "Staybrite" centrepiece, which is brilliantly illuminated by concealed fittings



A neon-illuminated fountain

A water-heating development is a new cylindrical 1½-gal. unit with a removable bottom plate complete with the thermostat and immersion heater. The loop element is of the embedded and sheathed type, and to overcome furring difficulties the loop is filled in with a steel block.

E.D.A.'s Display

We heartily congratulate the Electrical Development Association on its stand. It seems to be an answer to strong criticisms of the E.D.A. stand heard at the Birmingham section of the British Industries Fair, namely, that it did not represent utility as did the corresponding exhibit of the gas industry. At Olympia E.D.A. has on show every type of domestic appliance and we saw demonstrators and attendants working enthusiastically with visitors a few hours after the opening of the exhibition. One of the kitchens embodied in the stand is an excellent example of how standard equipment can be permanently built into the arrangements; the kitchen measures 11 ft. 8 in. square, and built-in there are a Belling cooker, an Electrolux refrigerator, a Densacone water heater, and an Ediswan drying cupboard.

The lighting of the exhibition generally is highly creditable, and one feature is particularly striking. A column of "Staybrite" tubes arranged in circles concentrically around a hexagonal core are situated vertically in the main hall, rising to a height of 75 ft. At the base sixty 60-W lamps in special parabolic reflectors project light upwards, resulting in the effect of a fantastic multiplicity of tubes. This feature was designed and constructed by A. O. Gibbons, Ltd., in conjunction with the architect, Mr. I. B. Jeffcott.

Metering Reactive Energy in H.P. Circuits

AMONG the many methods proposed for taking account of reactive energy absorbed or supplied by electricity consumers, one of the simplest is that specified by the French Ministerial Circular of November 24th, 1919, viz.: Add to the kWh recorded during the metering period 30 per cent. of the reactive kVAh recorded during the same period by a special meter, the sum being termed "complex energy." Mathematically expressed, this amounts to charging the consumer for W units of "complex energy," where $W = \int (P_a + 0.3P_r)dt$; P_a = active power; and P_r = reactive power.

As shown by C. Dietsch of the Laboratoire Central d'Electricité, in *Revue Général de l'Electricité*, the term $(P_a+0.3P_r)$ can easily be measured directly by an ordinary meter. In the case of sinusoidal currents, and in a single phase circuit:—

$P_a+0.3P_r = EI \cos\phi + 0.3\ EI \sin\phi$ ..... (1)

where ϕ = angle of lag of I with regard to E.

Suppose that an ordinary watt-hour meter of negligible error is fed by a current transformer of negligible error, and a potential transformer of correct ratio, but secondary voltage lag $(\pi-\theta)$ with regard to the primary voltage. The meter will then integrate $EI \cos(\phi-\theta) = EI \cos\phi \cos\theta + EI \sin\phi \sin\theta = \cos\theta\ (EI \cos\phi + EI \sin\phi \tan\theta)$ ..... (2)

If $\tan\theta = 0.3$, then $\cos\theta = 0.958$, and the expression (2) becomes $0.958\ (EI \cos\phi + 0.3\ EI \sin\phi)$, *i.e.*, the meter reading is proportional to the "complex energy" as expressed at (1) above. All that is required is thus an ordinary watt-hour meter with a potential transformer phase error $\theta = \tan^{-1} 0.3$.

The above formula for single-phase current is applicable to polyphase supply; and the sign of the second term is positive when I is lagging (reactive power absorbed) and negative when I is leading (reactive power supplied by consumer). The advantages claimed for this method of metering are the saving in first cost, and the simplification of connections and calibration.

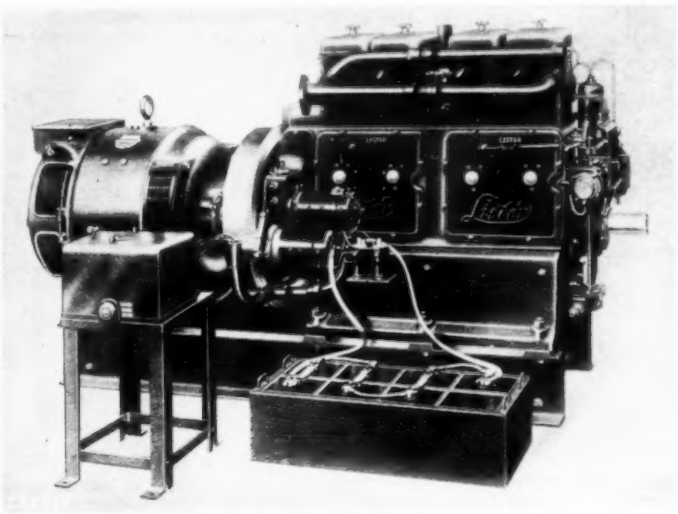
A Remote-controlled Diesel. By P. D. Jephson

Electrical starting and regulation

A SYSTEM of automatic remote control for small compression-ignition oil engines has recently been placed on the market by Messrs. R. A. Lister & Co., Ltd., which makes it possible to control from a distance, by means of an electrically or mechanically operated switch, an engine which may be directly coupled to a pump, compressor, or generator.

The actual starter gear is an electric motor operated by a battery of seven cells of 204-Ah capacity, the engine being rotated through the medium of an ordinary " Bendix " drive. A separate generator of 10-A capacity is fitted which keeps the battery correctly charged *via* a special charge regulator.

To effect a start it is necessary to first rotate the engine, turn on the fuel and move the compression change-over ratio valve to the high-compression position. These operations are effected as follows: On the remote control switch making contact current will flow from the battery to the starter motor contactor, which is mounted on the engine: this connects the starter motor to the battery and so rotates the engine. At the same time current is allowed to flow to the compression change-over valve contactor (also mounted on the engine) which places the engine on the high-compression ratio for starting, and a solenoid is energised which permits the fuel pump to supply fuel to the injectors.



The Diesel-engine set described in this article

As the result of this sequence of operations the engine fires. As it gathers speed the starter battery generator voltage builds up and at a predetermined speed the plunger of a solenoid connected across the generator rises and breaks the feed to the contactor controlling the starter motor, the pinion of which, therefore, disengages. The contacts of a further solenoid switch are in series with the compression change-over valve contactor coil and this solenoid switch makes contact when the contactor in question is energised and, in addition to completing the circuit to the contactor coil, energises the heating winding of a thermostatic delay switch, which, after a specified period, breaks the circuit of the compression change-over valve contactor coil and so allows the engine to run on its normal compression ratio.

The sequence of operations is then complete and the engine is able to take a full load. Under ordinary working conditions an engine operating under this scheme is available for delivering full load within thirty seconds of the remote switch making contact. When the remote switch breaks contact, the solenoid controlling the fuel supply is de-energised, thus causing the engine to stop.

Protective Devices

While the engine is being motored by the starter motor, the contacts of the starter relay cut-out are closed. A thermostatically operated circuit-breaker switch is permanently connected in the negative feed from the battery to the various solenoid coils. Should the engine fail to start within fifteen seconds the thermostatic strip of this circuit-breaker will warp, due to heating, causing the circuit-breaker to open and so disconnecting the battery from the starter motor. This operation eliminates the possibility of running down the battery should the engine fail to start through lack of fuel.

Should the fuel run short the engine will slow down and, as a result, the voltage of the battery-charging dynamo will drop. This will cause the starter relay cut-out to make contact, but the starter motor contactor coil will not be energised owing to the action of a thermal delay strip, which has its contacts connected in series with the feed to the starter motor contactor coil. After an engine has been running for about two minutes this delay strip will warp and its contacts will break, thus preventing the possibility of the starter motor attempting to cut in again. This delay strip also prevents the engine being started up immediately after a shut-down has taken place.

This principle has been put to practical use for automatic sewage pumping, automatic standby for a main electricity supply, and for automatic refrigerator work. The advantages to be gained by installing automatic Diesel plant are, therefore, twofold: first in many cases a considerable reduction in running cost can be obtained, and, secondly, it is possible to dispense with the services of an attendant, except for the small amount of work involved in keeping the fuel tank full and carrying out the necessary lubrication and cleaning at specified intervals. Where continuity of supply is of paramount importance it is always possible to install two plants, one as a standby, automatically coming into operation should the other fail, while in many public buildings by means of a simple electrically operated switch it is possible to arrange for the load normally connected to a mains supply to be transferred to an independent Diesel plant and for a certain proportion of the total lighting to be available within thirty seconds of the main supply failing.

A Turbine-governor Failure

A REPORT on the breakdown of a turbo-alternator at the Ifor power station, Dowlais, on February 17th, 1933, has just been issued by the Home Office (Stationery Office, 6d.). The station was owned by the British (Guest, Keen & Baldwins) Iron & Steel Co., Ltd., and in January, 1932, was leased to the South Wales Electric Power Co. to supply the steel works and a network of collieries. The plant includes two 5,000-kW, 6.6-kV, 50-cycle, 3,000-r.p.m. turbo-alternators, installed in 1923, and steam conditions are 200 lb. per sq. in. and 650 deg. F.

No. 2 set had been in continuous operation since October, 1932. At the time of the breakdown the load was 1,500 kW and the speed rose to over 4,000 r.p.m.; within a few seconds the set was totally wrecked, the alternator rotor, the turbo-coupling, and the main bearings being broken up, but no personal injuries were caused.

The governing system consists of a spring-loaded governor, a rotary oil pump (driven from the turbine shaft) supplying oil under pressure to the oil pot of each throttle valve and at a reduced pressure to the bearings. The three throttles are of the double-beat piston type, and come into operation successively with increases of load.

The emergency governor consists of a spring-loaded plunger housed in the turbine shaft which, at 10 per cent. above normal speed, is ejected by centrifugal force and strikes a bell-crank lever, causing a spring-controlled spindle to receive an angular movement which trips the main stop valve and releases the oil pressure in the oil pot, thus closing the throttle. Examination disclosed that although the plunger had been ejected, the spindle had not turned, so that the three-way cock was not in the position for releasing the oil pressure. The seizure of the part was presumably due to dirt, carbonised oil, or abnormal expansion.

The excessive speed was due to the shearing of a small screwed bolt, from which the governor sleeve links were suspended, and the bending of another similar bolt to which the outer jaw of the fork of one of the two rockers of the link gear was connected; this jaw was sheared at the root. There was evidence that some foreign body had caught between the inner jaws of the rockers and the boss of the governor. A consider-

able amount of sediment was found in the governor oil circulating system. As the turbine was on light load and high vacuum, a very small amount of excess steam would have a large effect on the speed. Although the throttle moved freely when cold it might have stuck at 650 deg. F.

Impact between the rotor of the alternator and the stator may have been due to vibrations at critical speed (4,200 r.p.m.), to deformation of shrunk-on end bells, or a winding wedge flying out and becoming jammed in the air gap. This rotor was manufactured in 1919, since when considerable developments have taken place in the method of heat treatment for forgings.

The inspectors suggest the provision of an isolating valve between the steam range and the turbine stop valve that would be closed at a slightly higher speed than that at which the normal emergency governor operates; its automatic tripping device should be operated from an independent source such as a secondary battery, the circuit being closed by a centrifugal switch fitted on the turbine shaft. An alternative suggestion is that a second stop valve should be connected in parallel with the ordinary stop valve and similarly equipped with quick closing devices, the two valves being so arranged that either can be tested independently without the necessity of shutting down the turbine.

Gyro-compass Motors. By J. F. Romer

The advantages of d.c. over a.c.

IN the various types of gyro-compass at present on the market the gyroscope is driven by a squirrel-cage motor which obtains its current from a motor alternator supplied from the ship's mains. As most vessels use d.c. there would not only be a considerable reduction in the cost of the apparatus but also other advantages would be obtained by driving the gyroscope by a d.c. motor.

A gyroscope and its driving motor may be regarded as a combination with zero efficiency, since, except when the gyroscope is precessing, no mechanical work is performed outside the case, all the power supplied being converted into heat. The power is dissipated in (1) bearing friction, (2) air friction, and (3) iron and copper losses in the motor itself. By using ball bearings (1) can be made very small; (2) is minimised by running in air at reduced pressure, usually about 23 inches mercury gauge of vacuum; while (3) can be greatly reduced by using a d.c. motor.

The greater part of the heating is due to the iron and copper losses, and in the past considerable difficulties have been caused by the overheating of the squirrel-cage motor. This is liable to cause an error in the compass, as, unless the gyroscope is perfectly symmetrical axially, which is seldom the case, unequal expansion and contraction will upset the balance and cause precession. Overheating also carbonises the lubricating oil and has caused considerable bearing troubles. Cooling the motor by filling the case with hydrogen proved to be very effective, but the danger of explosion through hydrogen leakage has caused this expedient to be abandoned.

A gyroscope having a mean diameter of 8 in. weighs about

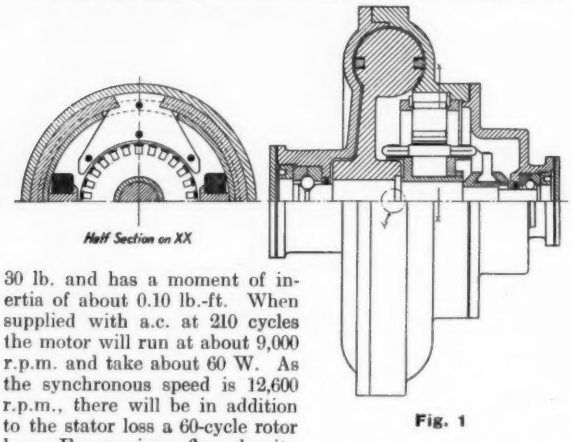


Fig. 1

30 lb. and has a moment of inertia of about 0.10 lb.-ft. When supplied with a.c. at 210 cycles the motor will run at about 9,000 r.p.m. and take about 60 W. As the synchronous speed is 12,600 r.p.m., there will be in addition to the stator loss a 60-cycle rotor loss. For a given flux density the iron losses are 89 per cent. greater than they would be with a d.c. motor running at the mean frequency of 150 cycles per sec., while reducing the flux density merely increases the size of motor without increasing the efficiency. The losses are still further increased by reason of the low power factor of about 0.7.

It has been proposed to compensate for this by using condensers, but this would only improve the efficiency of the generator and make no difference to the motor. Another suggestion was to use a compensated induction motor, but as this would involve the use of a wound rotor and slip rings, the advantages due to the simplicity of the squirrel-cage motor would be lost. A further difficulty arises from the fact that if the motor is made no larger than is necessary to drive the wheel at full speed it will take too long to accelerate.

With the moment of inertia stated and a torque corresponding to a power of 40 W, the motor would theoretically take about half an hour to get up to its maximum speed, but in practice because of the very poor starting torque of a squirrel-cage motor it may take from two to three hours. During this time the full stator frequency has to be maintained, and it is during this period that the greatest heating occurs.

With a d.c. motor there are practically no iron losses at starting, no loss through low power factor, and the full speed efficiency is much higher. The chief difficulties which have prevented the use of a d.c. motor are, (A) the armature has to be wound with fine wire and the insulation would shrink sufficiently to disturb the balance, (B) the gyroscope usually either floats in a liquid or is suspended by a wire, the arrangement being as sensitive as a suspended galvanometer; if any appreciable wear occurs on the brushes the centre of gravity is shifted sufficiently to cause precession and a consequent error.

Mr. J. F. Romer

With modern insulating varnishes of the bakelite type capable of being dried at high temperature, there is little possibility of subsequent displacement of the windings, and wear of the brushes can be compensated for over a considerable range by using a radial commutator and attaching a counterbalance to the spring finger in such a way that as the brush wears so the counterbalance moves outward and maintains the centre of gravity in a constant position.

A motor built on the principles described has a wheel rim of circular cross section and fits closely in the case. Experiment proves that the air friction with such a rim is about 25 per cent. less than with the usual rectangular rim running in a loosely fitting case. With such a small motor, a high flux density in the gap cannot be produced by field windings of reasonable size and there is consequently great advantage in using permanent magnets, as the heat loss in the field coils is eliminated. Permanent magnets, however, produce a machine in which the field is weak relatively to the armature and there is great flux distortion, particularly at starting; unless this is compensated for there will be considerable sparking and rapid brush wear.

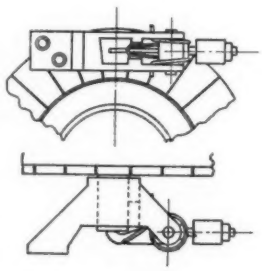


Fig. 2

The motor is therefore provided with commutating poles. As the permanent magnets, being saturated, will not carry the interpole flux, a separate yoke is provided, made in halves, between which the semi-circular permanent magnets are clamped. The complete magnet assembly is pressed into the gyroscope case.

The gyroscope is balanced on ball-bearing trunnions indicated by the dotted circle Y (fig. 1); this balance is very sensitive and will be upset by any slight wear of the brushes, or alteration in the position of flexibles. With a cylindrical commutator, this cannot be compensated for, but with the arrangement shown in fig. 2, using brushes without flexibles, the turning moment about Y is maintained constant irrespective of brush wear over a long period. Although the motor is a 2-pole one, the proportions are not those normally used, as it is necessary to keep the gyroscope as short as possible.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Large-scale Cooking

I read with interest the leading article on "Large-scale Cooking" in the ELECTRICAL REVIEW of March 23rd, and I would emphasise the difficulty in being able to obtain authentic information regarding the financial side of cooking for commercial purposes. Those interested in cooking installations are not so concerned with regard to the medium with which they can carry out their cooking as they are with the costs involved. When discussions have taken place, or papers have been written, on the subject comparative figures of a useful nature have been left severely alone, and if electric cooking on a large scale is to be developed, some very definite information should be forthcoming from the electrical industry.

You may be interested to know that within the last eighteen months we have installed in Glasgow an all-electric kitchen, the connected load of which is 350 kW. Included in this kitchen is a baking oven of 96-kW capacity. In Liverpool and Birmingham electric baking ovens have been introduced of a total capacity of 250 kW. Meters have been installed in order to ascertain the actual consumption which should give some very interesting figures for comparative purposes.

OSCAR C. WAYGOOD,
Chief Engineer,
Lewis's, Ltd.

Liverpool, *March 28th.*

Electricity in modern flats at Melina Court, St. John's Wood, N.W. A sitting room, with an inset fire, and a kitchen. (See page 496)

Domestic Supply Costs

You have often shown an interest in the consumption of energy in all-electric or nearly all-electric houses, and in 1929 you published an account of my experiences. Since then I have moved to a £600 semi-bungalow on an all-electric estate at Patcham, some three miles from Brighton. The supply is given by the Brighton Corporation.

My family numbers four. The bungalow contains a large dining-sitting room, 16 ft. by 12 ft., two bedrooms downstairs and two above, and bathroom and kitchen, with 15-A power plugs in every room.

The equipment comprises: a 5.8 kW cooker (4 to 6 persons), with control board for connecting an electric kettle, which is filled from the hot-water supply; a 3-kW wash boiler; a 1,000-W water heater; a portable and a built-in electric fire; a heater in the airing cupboard; and eight lighting points. An electric clock, vacuum cleaner, iron and wireless set are also installed.

No coal or gas being used (although a fireplace is provided) one demand note only covers all the usual services. The fixed charge, which is calculated on the area basis, is £4 7s. 6d. per annum (payable in advance), and the running charge is ½d. per kWh. The following details are extracted from accounts for 1933, as rendered:—

Quarter.	Fixed charge.	kWh.	Total paid.
March	17 6	3,349	£7 17 0
June	17 6	1,089	3 2 10
September	£1 6 3	717	2 16 2
December	1 6 3	3,305	8 3 11
		8,460	£21 19 11

The average rate per kWh works out at 0.625d. I estimate that at certain periods of the daytime during the winter quarters the maximum load probably reaches 8 kW. While consumption is uniform in the two winter quarters, the drop in the summer is accounted for by the non-use of radiators during the September quarter and the need for a small amount of heat only during the chilly evenings of April and May. From records kept over about seven years for an all-electric establishment I estimate that in the winter quarters, when the inlet temperature to the water heater is low, the separate consumptions would be: cooking, kettle, ironing and water heating, 750 kWh, balance for electric fires, 2,239 kWh, total 3,349 kWh. During the September quarter: cooking, &c., would take 300 kWh; and water heating 417 kWh, giving the total of 717 kWh.

Analysing still further the figures of consumption, it may safely be assumed that the consumption for cooking does not exceed 1 kWh per person per day, and that the average number of kWh used per person per year to enjoy an electricity supply for all purposes, based on the actual figures quoted above, is 2,115, or 6 kWh per person per day, costing 3.75d., taking into account the proper proportion of the standing charge allocated to each person.

F. S. SPARROW.

London, S.W.1, *March 28th.*

A Flexible Installation

Referring to Mr. McConaghy's letter in your issue of March 23rd, I sympathise with him in his difficulty to ascertain what points house purchasers want and where they want them, but I do not like his methods of overcoming this bugbear.

When his firm leaves the installation everything is in order and the I.E.E. Rules have been complied with, but what a chance for the "jerry" contractor to step in (the 7s. 6d. per point merchant), as unfortunately flexible installations are potential shoddy installations. True, this can be said of almost any installation, but when one leaves tubes terminating in bellmouths and cavities under skirtings for c.t.s. and lead-covered wiring one is asking for trouble.

A noticeable feature of this installation was the numbers of separate tubes passing through walls under doorways and fireplaces. Are these "earthed up" by means of twisting a piece of copper wire round the lug screw such as would have to be done for a three-pin plug? If so, I am afraid that the bulk of tubing would soon have no definite earthing, and with the voltage becoming universally 230 a.c. this is dangerous.

Personally, I have found that the best way to make a good flexible installation is by putting in a drawn-in job with all boxes inspection boxes. All tubes are large enough to carry 33 per cent. extra cables. Spare outlets are left on the junction boxes or extra boxes are put in. Spare ways are left in the switch boxes or nipples left in the erected switch boxes (if these are surface switches it is not necessary) and spare ways are left in the fuse boxes. When extra plugs are required on the first and second floors it is a simple matter to raise a board near the skirting and place them in, provided a board is

" trapped " at the junction box. On the ground floor capping would be absolutely superfluous, because if two boards are left trapped during erection one usually has access under the whole building.

Mr. McConaghy's method for bell wires and loud speakers is very good, but all the other expense of cutting away floorboards and replacing with capping is unnecessary. On new estates, where purchasers do not see their house unitl it is completed, present competition in this class of work rules out the idea of allowing too much for the future.

Edmonton, N.9, *March 28th.* Geoffrey T. Burdeit.

The Diesel and the Grid

Referring to Mr. Kennedy's remarks regarding a 300-kW Diesel plant reported on page 451 of your March 30th issue, if we assume a capacity of 300 kW, the kVA charge per annum, taken as low as £3 per kVA, would be well over £900. Does Mr. Kennedy intend to suggest that Diesel plant, even in duplicate, would cost £900 per annum?

Secondly, does Mr. Kennedy further suggest that a 300-kW Diesel set cannot generate at a lower cost per kWh than the grid would ask? Finally, may we point out that a firm which installs two 300-kW sets, one for standby, has a total of 600 kW at its disposal, for peak loads or further extensions? How much would the grid require per annum for 300 kW in reserve? Power Machinery Trading Co.

Hampton, Middlesex, *March 29th.* C. C. Macbride.

Service !

With all the regulations which the installation contractor is bound to adhere to is it not nearly time that supply authorities were brought up to scratch and also about time some of them tried to satisfy consumers?

A housing estate for which my father is agent is supplied by a District Council. About six months ago he asked for a house to be connected up—this was done last week. The service is v.i.r. cable, on cleats along the boards underneath the eaves where it can be easily reached from the window.

One of these cleats was missing, with the result that the window could not be opened. My father complained of this, and last week a workman came to see the job. The following morning four workmen arrived with a lorry, and after much consultation tied the v.i.r. up with string and departed, apparently quite satisfied that a good job had been done. These people were told on a Friday that the main service fuse for eight houses had blown. They replied that it could not be repaired until Monday. It is time that cases like this were remedied and then more consumers would be found.

April 2nd. Wireman.

The Power Factor of Neon Signs

What is the legal position between supply companies and authorities in connection with the power factor of neon signs? I refer to an installation in a large shop in Glasgow where the ordinary lighting load is considerable. Recently a small neon sign (about 250 W) has been added. The power factor of this sign is 0.55. The overall power factor of the installation is above 0.90 (with the sign connected). The sign is not used alone, *i.e.*, when the shop is shut.

Are supply companies legally entitled to " pick " on this trivial part of the total load and insist on the power factor being " corrected "? Plumber.

April 2nd.

Contractors and Supply Authorities

We note with satisfaction that one more of our unfortunate brethren has awakened to the menace of the contracting supply company. You published a letter from me on this subject some twelve months ago, but, strange to say, there appears not to have been any further correspondence until the last two weeks.

There is another practice which is steadily growing. Corporations advertise for tenders, and finally let them to a local contractor whose price is higher. This has been our experience on three occasions during the last six months. If they intend to do this in the first place why let outside firms tender?

Contractors should take the offensive, and I trust that some one will put forward a scheme whereby this unsatisfactory state of affairs will be stamped out.

April 3rd. Still Another Contractor.

What is Expected of a Cooker

At an informal meeting of the Institution of Electrical Engineers held on March 26th, with Mr. M. Whitgift in the chair, a discussion on " Modern Development in Electric Cookers " was opened by Miss D. Vaughan. The very large gathering included a number of experienced lady demonstrators and members of the Electrical Association for Women.

In her opening speech, Miss Vaughan said that there had been many attempts to produce the perfect electric cooker. Manufacturers had striven to produce something that all supply engineers would accept, and supply engineers had given much time and thought to the cooker industry, but it would all be of no avail unless the article produced was what the housewife demanded. Therefore much valuable time and energy would be saved if the housewife could have what was practical from her point of view, and since all women knew what they wanted, even though they could not always have it, it might be simpler to try satisfying the housewife first and the electrical expert afterwards.

Miss D. Vaughan

It was obvious that the time had arrived when those who were not caring what fuel they used would probably be given electricity by their housing committees, &c. It was therefore essential that the apparatus should be designed in such a manner that the housewife could use the cooker as she wished to use it, to cook anything at any time, without having to plan to suit her cooker. For years manufacturers had been handicapped by high charges for cooking, and the loading of cookers had always had to be restricted; now we were told that there was an unlimited supply of electricity available at a cheap price, and it must be used. This should mean that at last we were to have really quick preheating of ovens and rapid boiling—to use the heat and not to have to conserve it because of the expense. We were told that electric ovens and gas ovens heated up in approximately the same time—fifteen to twenty minutes; often with ovens 400 deg. was quoted as being reached in twenty minutes, but the instructions were to use 450 deg., 475 deg., 550 deg., &c., when cooking foods: consequently the preheating time was not twenty minutes, as it should be, but nearer thirty minutes.

There were two schools of thought among users of electric ovens: those who liked to get the heat quickly—to use it and finish—and those who did not mind the preheating period and would use the residual heat. The former were found among housewives who did not plan ahead, who must have a piece of cooking apparatus that would give them heat immediately. Numbers of this type of women existed, and no amount of explanation or education would alter matters. For this market a more heavily loaded oven might be introduced, with special elements and switching.

To the experienced user of electric ovens it was comparatively easy to arrange a packed oven so as to have a minimum number of changes of position in the food and switches, but to many housewives the manipulation required was confusing. There had been considerable arguments concerning the correct height for cookers—every woman would prefer an oven that required no stooping, and the idea of a shallow oven did tend to raise ovens from the floor. The important point was that every oven of family size must be able to be packed easily, and it was agreed that very small cookers gave a greater output and required much less management than larger ones.

All demonstrators sympathised very much with one another when dealing with large audiences where different makes of cookers were being used; it was almost impossible to convince the prospective user that electric ovens were simple when people at a demonstration disputed among themselves the temperature into which they put various foods. Was it not possible for manufacturers to decide to reach a temperature for cooking certain foods, and have markings of " Slow," " Moderate," " Hot," " Very Hot," with the foods that cooked at these temperatures indicated on the thermometer? It mattered little how these details were arranged, but to compete with the ease of regulation of temperature of other fuels we must have something similar. Automatic control was being introduced, and perhaps that would be the solution.

In conclusion, Miss Vaughan appealed for consideration in the discussion of the following points: Design and loading of ovens, including quicker pre-heating of ovens; standardisation of thermometers; automatic control of ovens; quicker boiling; easy simmering ,and variation in size of grills.

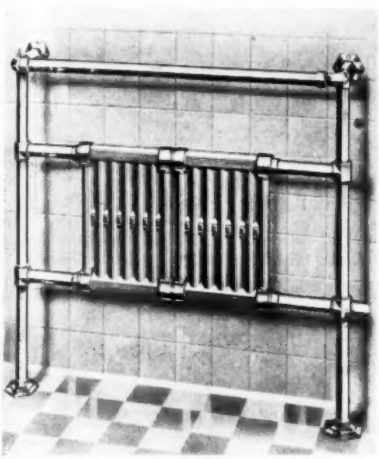
Twenty-four speakers took part in the subsequent discussion and a great variety of views was presented.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Hexagonal Hot-water Towel Rails

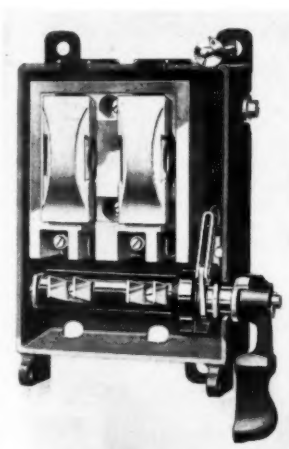
To cater for modern tastes MESSRS. GEO. NOBBS & CO., LTD., 87, Cleveland Street, Euston Road, W.1, have produced a range of "Genii" hot-water towel rails with the actual rails and supports hexagonal in shape. They are constructed of heavy gauge solid drawn 1¼-in. brass tubing tested to 100 lb. per sq. in. pressure. Either heavily nickel-plated or chromium-plated on nickel, they are highly polished and fitted with a special earthing terminal, a relief valve and a water-level plug, in addition to the totally enclosed immersion heater by virtue of which hot water is circulated round the entire rail, imparting an even temperature throughout. About a cupful of "make-up" water is required two or three times a year. Standard floor models, all 36 in. by 36 in., include one with a single top rail (nickel-plated, 200 W, £9 5s.; chromium-plated, 160 W, £10 5s.), a double top-rail unit (n.p., 250 W, £10 10s.; c.p., 200 W, £12), and a model with a central hot-water radiator (n.p., 400 W, £13; c.p., £15 10s.), the radiator section being dull-nickel.



A hexagonal "Genii" towel rail

A 10-A Ironclad Switch-fuse

The new "Memten" 10-A switch-fuse has been designed for mains service in small houses. It is completely ironclad, and the moving contacts are carried on a solid bar of "Memite" insulating material, all the current carrying parts being liberally rated and tinned to prevent corrosion.



The "Memten" switch-fuse

It is claimed that the switches are capable of breaking a load at least 100 per cent. above the rating, and that the fuses will safely rupture under a short-circuit current of a 100 times the rated capacity. The weight of the switch is 2¾ lb., the dimensions 5½ in. by 4 in. by 2½ in., and the price 3s. 10d. (singly).

Miniature Amplifying Valves

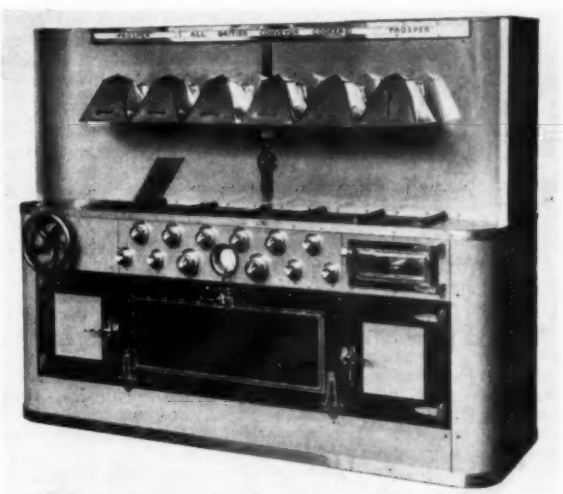
The main feature of two new thermionic valves which are being placed on the market by the GENERAL ELECTRIC CO., LTD., and the MARCONIPHONE CO., LTD., is their unusually small dimensions. They are amplifiers for use in deaf aid equipment, &c., and are smaller than a box of matches. The actual overall length is about 2 in. and in order to avoid any waste space the use of an ordinary pin base valve-holder has been done away with. Instead a new form of bakelite side contact base with metal strips running along the side of it makes contact with the special type of valve socket required. It is not intended at the moment that this form of base shall be applied to any valves other than the "Tom Thumb" type.

The filament rating is 1 V 0.1 A. The valves give respectively an amplification factor of 15 for an impedance of 30,000 ohms, and an amplification factor of 5 for an impedance of 12,500 ohms. Both the valves are designed to operate up to a maximum anode voltage of 45 V and they are listed at 15s.

Novel Cooking Equipment

A new combined baking oven and cooker, which is primarily intended to be used in confectionery establishments and tea-shops, has been specially designed for cooking pancakes, which require to be turned over or tossed when a frying pan is used for the purpose. The "Prosper" all-British conveyor cooker is so contrived as to do this operation mechanically. Countersunk in line flush with the top of the cooker is a series of five 1-kW hot-plates hinged on the up-tilt principle. A radiant heater element in a cowl above directs a hot beam downwards so as to "set" or congeal the batter when it is placed on the first hot-plate. When the underside of the batter is partly cooked, the hot-plate is caused to tip up vertically with sufficient suddenness to throw the pancake over on to the second hot-plate, uncooked surface downwards. After a lapse of time the pancake is similarly thrown from the second to the third hot-plate, again upside down, and so on until it reaches the sixth plate, which is a dummy that opens to allow finished pancakes to fall into a storage compartment, whence they are removed through a glass-fronted door as required.

The hot-plates are actuated in correct sequence by endless chain mechanism at the rear, driven by a 0.25-h.p. motor. Above each hot-plate a ventilating cowl serves to carry away fumes and also to provide illumination, each containing a lamp, except the first, which is fitted with the radiant element.



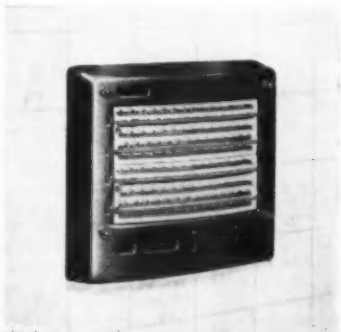
The "Prosper" cooker

The lower compartment forms a long narrow oven with three doors, the centre one glazed with heat-resisting Pilkington armour-plate glass to allow the cakes to be seen while baking, and they can also be moved along on the conveyor bottom, which is actuated by a handwheel. The oven is suitably lagged and loaded to 6 kW, the elements being disposed at the top and bottom, and when the door is pushed to the catch engages positively, thus preventing loss of heat.

On the central control panel is a circular oven thermometer, two three-heat oven switches, a separate three-heat switch for each hot-plate; one switch for the radiant heater, one for the motor, one for the lamp inside the oven, another for the cowl lamps, and one for the main indicator striplite at the top of the structure, which is built up of angle-iron framework enclosed in sheet steel and finished in vitreous enamels of bright colours, with chromium plated fittings and a stainless steel hob. The approximate overall dimensions are 7 ft. in length, 5 ft. 6in. in height, and 3 ft. in depth. The heating elements are of George Bray & Co.'s manufacture and the cooker itself is made by AIR DUCTS, LTD., Great West Road, Brentford, Middlesex.

Inset Fires

Three new fires have been added to the already large range made by the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1. They consist of an inner frame upon which the elements are mounted, and a chromium-plated or vitreous-enamelled outer frame, which can be obtained in six colours. Ease of fixing into position is specially catered for, whilst access to interior parts, should necessity arise, can be readily obtained. The 2-kW and 3-kW fires have one and two switches respectively, and the fire units are suitable for adaptation to existing tiled surrounds.



The new Jackson 2-kW inset fire

In vitreous enamel finish the 1-kW, 2-kW and 3-kW fires are priced at 17s. 6d., £1 10s., and £2 6s. 6d.

D

respectively. In chromium-plated finish the prices are £1 6s., £2 4s., and £2 16s. respectively. A chromium-plated reflector plate is recommended for use where the material behind the fires is other than brick, stone tiles, metal, or similar material.

"Universal" Radio Valves

Radio valves designed to work on either a.c. or d.c. and at almost any voltage are now an established fact. The complete range of the MULLARD WIRELESS SERVICE CO., LTD., 111, Charing Cross Road, W.C.2, will consist of eleven types, the first six available being two screen-grid pentodes for high-frequency amplification, an octode frequency changer, an output pentode having an anode dissipation of not less than 8 W, a double diode, and a half-wave rectifier, all indirectly heated.

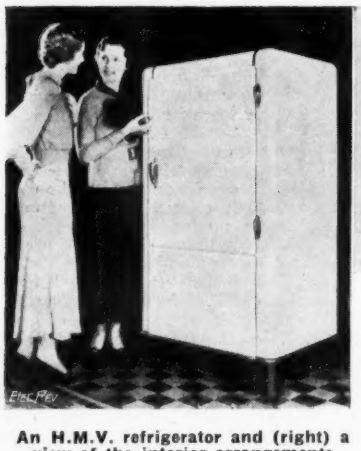
One of the new Mullard "Universal" radio valves

In external appearance they are most unusual, since they are without pins. Instead, the bases are fitted with special brass contacts that fit into sunk holders, thus improving contact and also making possible greater clearances between connections. Another change, which is standard in all types, is that the grid is brought out to a thimble connection at the top of the valve, and connection is made by means of a spring clip. The glass bulbs, with the exception of the output pentode and the rectifier, are to be metallised externally in gold colour. These new valves are generally smaller than the corresponding a.c. types.

H.M.V. Refrigerators

The first range of refrigerators to be marketed by H.M.V. HOUSEHOLD APPLIANCES, LTD., 363/7, Oxford Street, W.1, will comprise four domestic models of 4.7, 5.4, 6.7, and 7.8 cu. ft. storage capacity, priced at 40, 50, 60, and 70 guineas, hire-purchase terms being available. These machines are made in America, but it is intended in due course to manufacture them at the company's Hayes factory.

All the models are mounted on a lustrous black base, have rounded edges, and are free from projections. The three larger models have an unscratchable and unstainable white porcelain finish inside and out, while the smallest is cellulose lacquered outside. The neat chromium-plated door hinges and handle are so designed as not to catch on clothing, and the door catch opens at a touch of the elbow or finger, thus leaving both hands free. A lamp concealed in the interior is automatically switched on when the door opens.



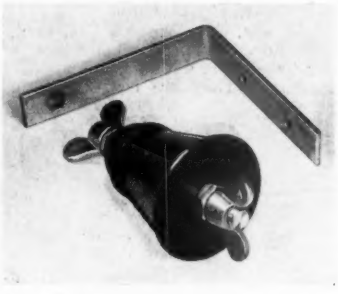
An H.M.V. refrigerator and (right) a view of the interior arrangements

The ice-making capacity is unusually large, varying from forty-eight to ninety-six cubes, of from 5.25 to 9.75 lb. in total weight. The ice cupboard has a hinged door, which cannot be damaged by the main door, and one of the three ice trays provided is made of rubber, the flexibility of which enables the cubes to be easily extracted.

The food compartment is above the mechanism, thus minimising stooping. The inside lining is made in one piece, with the floor sunk in the centre to facilitate the removal of spilt liquids. All corners are rounded, and the lower front edge is bevelled for easy cleaning. The shelves are adjustable in height, and in some models sections of the shelves are removable to provide unusually large bottle storage space. The total shelf area varies from 9.2 to 15.4 sq. ft.

The temperature is controlled thermostatically, the mean value being adjustable in nine steps by a controller fitted inside the cabinet, where the main switch is situated. The mechanism is enclosed in the lower compartment of the cabinet. In front is a ¼-h.p. motor (⅛-h.p. in the two smaller models) belt driving the compressor circulator, which is of the low-speed rotary type and completely submerged in oil. The two machines are side by side on a common base-plate which is mounted on springs. Behind is the condenser, with the receiver above it, sulphur dioxide being the refrigerant employed. The dimensions of the smallest model are 52¼ in. in height, 24 in. in width, and 23¾ in. in depth.

A Bakelite Lightning Arrestor



The "Goltone" bakelite lightning arrestor

We have received from MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Salford, 6, a sample of an improved bakelite lightning arrestor priced at 2s. 6d. The construction is such that it should withstand rough weather conditions, and all the metal parts are substantial and of brass, with the exception of the galvanised bracket. Mica washers are inserted in the spark gap to prevent the possibility of a short-circuit and so obviate accidents.

A "Solon" Waffler with Thermostatic Control

The domestic model "Solon" electric waffler, manufactured by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1, can now be obtained fitted with a thermostatic control, the retail price being £2 7s. 6d. This model is supplied fitted with a blue base and an extended lifting handle on the lid, and is designed for use where the waffler is not under constant supervision.

The new "Solon" electric waffler fitted with thermostatic control

The thermostat controls the heat supply, thereby retaining the correct cooking temperature and preventing the grids becoming overheated. The grids are encased in chromium-plated steel shells, whilst the base is of porcelain enamelled cast-iron in a tasteful blue shade. The long handle facilitates raising and lowering the lid portion. All necessary accessories are supplied, including a 6 ft. length of Henley tough-rubber-sheathed flexible with combined plug and adaptor.

Mains Frequency Inductance Bridge

It is very often important to know the actual impedance of small iron-cored coils under working conditions, and the mains frequency inductance bridge recently brought out by the BALDWIN INSTRUMENT CO., 91, Belle Grove Road, Welling, Kent, should prove valuable to makers of relays of all kinds and for checking the design and production of the numerous iron-cored windings that form part of so many electrical mechanisms.

The instrument gives inductance values directly without the need for calculation, and such readings are obtained in a very few minutes. It has two scales under the windows in the panel. In both cases a hair line cursor indicating the balance point is moved directly by a draw rod protruding from the side of the case, that on the left hand operating the phase angle scale and that on the right hand the inductance scale. The phase angle scale is approximately uniform, and is calibrated from 41 deg. to 90 deg. The inductance scale is logarithmic and reads from 0.45 henry to 110 henrys. The load on the coil under test is shown on the meter at the top of the panel. The point of balance of the bridge is obtained by observing the motion of a vibration galvanometer when the two draw rods are moved in and out.

The Baldwin mains frequency inductance bridge

The bridge is fed from the mains through a variable ratio transformer, and a complete system of interlocking is provided to prevent overloading the bridge and to ensure safety to the operator. The instrument is well finished, conveniently arranged, and substantially made for continuous operation. It is priced at £56, the selling agents being MESSRS. E. R. MORTON, LTD., 11, Newman Street, Oxford Street, W.1.

Our Relations with the Public. By J. Vaughan Harries

Educating and interesting the consumer

SINCE it is estimated that only one out of every three homes in the country is served with electricity, it is obvious that our relations with the general public should be such that the homes not at present electrically served must within reasonable time be connected to some source of supply in a manner satisfactory to consumer and supplier alike. The task before us is not an easy one. Although we are not public servants in the accepted sense, as, for instance, a Government department, it must be readily admitted we are at the service of the public and only to the extent that we acknowledge this responsibility can we hope for immediate or future success.

Consumers can be classified into two groups, actual and potential. Whilst focusing our attention on the latter, sight must not be lost of the consumer already on our mains. To have obtained a consumer may be the result of diligent, tactful persuasion, but at its best can only be termed "apparent success." When, however, the consumer expresses pleasure at the service obtained then "apparent success" becomes "actual success."

How best then can we educate the present-day public to the value of our goods? Even in these days of intellectual enlightenment it is common to meet persons who are prejudiced against the use of electricity in its application both for industrial and domestic purposes. Vested interests in contemporary forms of power and lighting, the question of safety, such as enters into the mining and chemical industries, and other things present complexities that make it difficult to approach certain sections of the public. Taken in the light of modern experience, all these, except the first-mentioned, can be answered to the benefit of electrical engineering. It is the duty of all employés of any supply undertaking to equip themselves with information that will assist in stemming the tide of such misguided opinions and trifling prejudices.

General Activities

A great deal of knowledge can be obtained by making oneself active in one or more of the many institutions and associations that have for their purpose the popularisation of electricity. These societies offer opportunities of debate and discussion, and, without looking at the selfish personal side of being able to advance one's knowledge and status, it is at meetings of groups of experts on various subjects that information telling of the most notable works and achievements can be received and then distributed to the public for their advantage.

Having equipped oneself with the essential information there is no finer plank on which to stand in our efforts to educate the public and thereby improve our relations with it than the city debating club or the village improvement society. In these gatherings we meet all classes of persons, representing various interests such as agriculture, transport, industry, domestic and public utility. In such societies will be met the man who directs labour, managers of collieries and works, women who are anxious for all news of that which is good for health and cleanliness for the home. In these democratic days it is the ordinary layman who votes the legislation of to-morrow and to convince the ordinary man of the commercial, health and utility value of electricity is to lay the seed of permanent prosperity. The public should be treated with good practical illustrations and not asked to gulp down technical data or wearisome statistics.

"As the Twig is Bent ——"

Much value is placed on child education and the education of the adolescent. The study of electrical applications for all purposes should be placed on the curriculum of all day and night classes. Lessons learned at this age are always of great value in later life.

Having obtained a consumer, we should never lose interest in him; rather it should be our duty to assist and advise as to the best means of obtaining the many advantages of electrical energy. On the other hand, care should be used never to arouse the suspicion of the user. Waste of time and material will often upset a keen consumer, because he wonders whether his unit would have been cheaper were it not for such extravagance. If, for instance, a wayleave has been granted, the pole should be erected and conductors slung in quick time; or, again, if a complaint has been reported the remedy should always be a rapid secure job. These have a great effect upon the public's view of the administrative and engineering sides of a concern. Our association with the members of our public should at all times be of the warmest and happiest nature. Remembering that we are spoken of as "Jones of the Power Company" or "Brown, that electricity chap," our citizenship should be exemplary, always realising that our employers share our honour or dishonour, as the case may be.

Belgian Electrical Trade

BELOW are given the values in 1933 of Belgian imports and exports of electrical material, with the principal countries of origin or destination, and a note of increases or decreases as compared with 1932.

Total imports of electrical machinery and apparatus last year were valued at 338,300,000 fr. as against 401,100,000 fr. in 1932, while exports amounted to 156,000,000 fr. as against 223,300,000 fr. It will be observed that imports as a whole have not decreased so heavily as exports and that Belgium is still on balance nearly twice as large an importer as exporter of electrical goods. Germany is the largest supplier. The United Kingdom's principal contribution was wireless valves.

	1933. Thous. Frs.	Inc. or dec. Thous. Frs.
IMPORTS		
Dynamo-electric machines—		
Total	47,370	− 10,410
From Germany	23,110	− 780
„ France	4,760	− 1,840
„ Sweden	4,330	− 4,090
„ Switzerland	5,350	− 520
Dry cells—		
Total	5,050	− 630
From Germany	1,240	− 170
„ Denmark	2,650	− 310
Accumulators and parts—		
Total	2,400	− 1,100
From Germany	510	− 210
„ United States	700	− 550
„ United Kingdom	980	+ 100
Submarine and underground cable—		
Total	1,040	− 660
From Germany	740	− 760
Cable, rubber covered, but not armoured—		
Total	1,800	− 400
From Germany	770	− 30
Other cable—		
Total	5,320	+ 420
From Germany	3,040	+ 210
„ Switzerland	1,070	+ 40
Carbons—		
Total	4,400	− 400
From Germany	1,210	+ 260
„ United States	1,420	− 440
„ France	1,320	− 60
Electrical porcelain—		
Total	3,430	− 10
From France	2,480	− 40
Insulating tubes—		
Total	3,500	+ 400
From Germany	3,100	+ 300
Other insulating materials and parts—		
Total	4,500	− 400
From Germany	1,300	+ 300
„ France	2,200	− 1,000
Metal filament lamps—		
Total	8,000	− 2,300
From Germany	1,500	+ 100
„ Hungary	1,600	− 1,600
„ Holland	4,100	− 800
Wireless valves—		
Total	16,800	− 7,300
From Holland	9,400	− 3,400
„ United Kingdom	2,400	− 3,600
Measuring instruments and parts—		
Total	17,000	+ 300
From Germany	7,400	+ 200
„ Switzerland	6,200	− 900
Telegraph and telephone material—		
Total	103,000	− 26,000
From Germany	29,000	− 14,000
„ United States	19,000	− 6,000
„ Holland	43,000	− 3,000
Electrical apparatus, not elsewhere specified—		
Total	110,000	− 9,000
From Germany	47,000	− 4,000
„ France	20,000	+ 16,000
„ United Kingdom	8,700	+ 2,000
„ Sweden	6,100	+ 1,800
„ Switzerland	5,600	− 600
EXPORTS		
Dynamo-electric machines—		
Total	20,400	− 12,600
To Congo	3,500	+ 200
„ Argentina	2,700	+ 500
„ Holland	3,100	+ 700
Insulating tubes—		
Total	1,600	+ 200
Accumulators and parts—		
Total	2,800	− 600
Submarine and underground cable—		
Total	18,100	− 8,900
To Germany	3,600	+ 900
„ Egypt	3,000	− 4,000
„ United Kingdom	3,900	+ 700
Cable, rubber covered, but not armoured—		
Total	17,700	+ 4,900
To Holland	1,700	+ 500
„ United Kingdom	6,800	+ 1,100
„ South Africa	1,500	+ 1,000
Other cable—		
Total	7,300	− 6,300
To India	2,600	− 100
„ Holland	1,000	− 200
Metal filament lamps—		
Total	9,400	− 3,600
To Denmark	900	+ 100
„ India	1,000	+ 100
„ Norway	1,200	− 100
Telegraph and telephone material—		
Total	46,500	− 22,600
To Brazil	7,000	+ 6,400
„ France	2,000	+ 200
„ Italy	1,700	− 2,200
„ Holland	6,900	− 10,300
„ Rumania	5,000	—
„ Switzerland	10,300	− 16,700
Electrical apparatus not elsewhere specified—		
Total	21,000	− 8,400
To Holland	3,500	− 600
„ Switzerland	7,400	+ 600
„ France	4,000	− 4,000

New Books

Handbook of Technical Instruction for Wireless Telegraphists. By H. M. Dowsett. Fifth edition. Pp. 572; figs. 525. London: Iliffe & Sons Ltd. Price 15s.

This is the latest edition of a well-known technical handbook for operators. The previous edition was published in 1930, and this one brings the materials up to date by amendments in the text and important additional matter on echo sounding apparatus, marine short-wave apparatus, marine radio telephony, and band repeaters.

The book is planned primarily for the use of ships' wireless operators, prospective or actual, and has been used for many years as a standard textbook at sea and in wireless schools which train candidates for the Postmaster-General's certificates. For the latter purpose it is intended to be a complete course, but the first portion of the book which deals with electricity and magnetism is hardly full enough for that purpose, while, on the other hand, the mathematics is sometimes more advanced than the standard required for the certificates. The new matter on radio-telephony, which is required for the certificates and was hardly touched upon in the previous edition, makes the book more complete from the candidate's point of view, but some expansion of the portion dealing with quenched spark sets would have been an improvement.

There is a good deal of matter which is not required by candidates for the certificates, and the new subjects considered, with the exception of telephony, come under this heading. These subjects, however, are of great interest to the operator when he gets to sea, and are therefore necessarily included in accordance with the plan of the book. The detailed information for telephone working might, with advantage, have embraced other sets than those of the Marconi Company.

We know of no textbook which is so well adapted as this one for the use of the prospective operator in British ships, nor one which would be of more use to him at sea.

A Text Book on Heat. By A. W. Barton. Pp. 378; figs. 110. London: Longmans Green & Co. Price 7s. 6d.

This book is for students working for university scholarships and taking the Higher School Certificates and university intermediate examinations. Although barely adequate for the B.Sc. student, it should serve admirably as a foundation for further reading. A historical and scientific method of treatment has been adopted throughout, and a large amount of modern work has been introduced, together with sufficient theoretical matter to explain the reasons for the various researches.

The treatment of temperature scales is good, and fuller than is usual in books of this kind. Electrical methods on specific and latent heat are well treated, and recent work is given in this and the next chapter, *e.g.*, that on the expansion of crystals. Two chapters cover the ordinary methods of determining the expansion of liquids and gases, but no mention is made of the late Prof. Callander's recent work on liquids. In considering the mechanical equivalent of heat, many laboratory methods have been omitted, but electrical methods are discussed fully. The chapter on the kinetic theory is excellent—explanations are given on this theory of the atomicity of gases, and even viscosity and conductivity are compared. The chapters on thermodynamics hardly go far enough, and that on conduction is also weak on the experimental side.

The book is well written, and the production is excellent both as regards typography and diagrams. Several useful tables are included, and at the end of each chapter there is a varied collection of questions, the answers to which are given subsequently. There is a dearth of books of this standard on heat, and at such a price this book is welcome.

Traffic and Trunking Principles in Automatic Telephony. By G. S. Berkeley. Pp. 252; figs. 65. London: Ernest Benn. Price 10s. 6d.

The science of automatic telephony has not been the subject of expert study long enough for the market to be overstocked with text-books on its technique. This work fills one of the gaps successfully, and is written for the student and the practician who, having mastered the theory of automatics, has commenced to grapple with the problems of its practical application. The reader is conducted in nine concise chapters through the various stages from the preliminary study and analysis of traffic incidence and characteristics, together with its measurement in traffic units, to the completed design and layout of the exchange plant.

Trunking principles and practice are the main theme, and five chapters are devoted to it. The author deals with "chance" and smooth traffic, grade of service and standards, permissible deterioration, full and limited availability, traffic capacity of trunks under varying conditions of loading, grading and standard of service, junction provision for satellite exchange and manual board traffic, and the various methods employed in the grading of trunks. Erlang's theory of probabilities and its application to switching problems receives special attention. This is, so to speak, the actuarial side of economic plant provision, and the student will find it necessary to devote some time to the paragraphs. If the mathematics should be beyond him the more difficult passages can be bypassed without disaster.

Illuminating paragraphs are provided on numbering schemes, and their suitability in director and non-director areas, service observations, group congestion records, the uses of tandem and satellite exchanges, allocation of uniselectors, tandem, direct and alternative routings and auto exchange designs.

On the construction side, plant layout, grouping of switches on the racks, distribution frames and cabling receive adequate treatment. The author has realised the value to the student of good explanatory diagrams and clear photographs, and typical examination questions are given at the end of each chapter. If fullness of exposition had not been sacrificed to brevity in places the appeal of the book would have been widened to include all those whose interest in automatics is not strictly vocational.

Principles of Radio. By Keith Henney. Pp. 503; figs. 311. London: Chapman & Hall. Price 21s. 6d.

Mr. Henney has been associated for many years with well-known American periodicals which deal with radio broadcasting. In this book he deals with the fundamental principles of broadcast reception, and gives an outline of the principles of transmission. This is the second edition of the work, which was first published five years ago, and much of the purely radio part has been rewritten, and is now well up to date. The author has been careful to keep to fundamentals throughout, using only simple mathematics. No previous knowledge of electricity is assumed, but the first quarter of the book deals with the electrical principles required for an understanding of the remainder.

The book is well provided with experiments and problems so that the student can test his knowledge as he goes along, but we think it would have added to the value of the numerical problems if answers had been given, especially as the author says that he has written for those who must study without a teacher as well as for those who attend classes. The problems are of a practical nature, dealing with circuits and constants met with by radio engineers, and the experiments are designed to give "the feel of the apparatus" to the experimenter. These experiments and problems are an outstanding, and very welcome, feature of the book, but even with their aid a student with no previous knowledge of the subject would find great difficulty in tackling the book alone.

Some of the practice and symbols differ from those used in this country, but not enough to impair the value of the book for English students. It is refreshing to find a book on broadcast reception which does really deal with principles, and it should prove of value to students of the subject in this country as well as in America.

Theorie der Elektrizität—Vol. 2. Electron Theory. Sixth edition. By R. Becker. Pp. 400; figs. 86. Leipzig: Verlag B. G. Teubner. Price 17 Rm.

The rapid advances of physics bring successive editions of this book further from the work of M. Abraham on which it is based. The first volume still contains much of Abraham's text, but the present volume has been completely rewritten in the light of recent progress in theory and experiment. The new presentation is based mainly on the classic electron theory, which is practically indispensable pending the formulation of a fully satisfactory quantum theory of the electromagnetic field. In experimental research, too, interpretation on the basis of the classic electron theory is often more fruitful than too rigid adherence to the concepts of quantum mechanics. The author takes cognisance of the latter throughout, and applies them fully, in relation to metal electrons and vacuum radiation.

The main sections of the book deal with the general bases of the electron theory, the elastically bound electron, field equations in quiescent media and in slowly moving non-magnetic bodies, the electron theory of metals, relativity theory, and the theory of vacuum radiation. The treatment given presents the interdependence between theory and experiment more forcibly than has been possible in earlier editions. A stage of knowledge has been reached which reveals many difficulties still to be solved, and the author's work forms an invaluable statement of the present position and an admirable preparation for further study and investigation. The production of the book calls for the highest praise.

Industrial Accountancy. By H. A. Simpson. Pp. 270; figs. 101. London: Longmans, Green & Co. Price 10s. 6d.

This book gives a detailed description of the cost accounting, financial accounting and works planning and progressing systems in force in one of the largest organisations in the iron and steel industry. The work is illustrated with specimens of forms and methods used in practice, and, although these are in many cases more elaborate than those necessary in the average manufacturing firm in the electrical industry, the fundamental principles which they illustrate are of real practical interest.

The first few chapters of the book are devoted to problems of factory organisation and routine, with special reference to the advantages of centralisation of all clerical work and of the control of production planning and progressing and of central invoicing. There are several good ideas in these chapters worth adopting. The author then goes on to show, with illustrations of the forms and reports involved, how the wages, raw materials and stores departments furnish the central cost department with items of cost in unit formation

allocated to departments' processes and jobs. In this connection, a description is given of the pay-roll method used in the steelworks whereby making up and checking wages can be done at the rate of 400 men per hour by a staff of two.

The next section of the book illustrates how this basic cost information is analysed on weekly cost summaries that also serve as ledger sheets. These cost summaries guide the management in measuring the efficiency of production and form the financial account of each department. Finally, the author discusses the third-entry principle, and shows, with practical examples, how it is possible to arrange that the figures used by the cost department form the basis of entries to the financial journal.

Cost figures must be produced promptly if they are to be of any value, but, of even more importance, they must be used properly. The author stresses the importance of measuring the costs against some reliable "yardstick" to enable inefficiency to be detected. The book is a sound and practical one.

* * *

Shorter Notices

"A Review of the Grid Scheme, its Inception and Operation," by W. Fennell. Pp. 24. London: Electrical Press, Ltd., 2s. 6d. This work summarises the events which led up to the passing of the 1926 Act, describes the constitution of the Central Electricity Board, and defines the conditions of buying from and selling to the grid. It sets out the obligations of the Board with regard to giving supplies, and the provisions of the 1926 Act relating to the selection and closing down of stations; it briefly epitomises the frequency-change schemes and the position relating to compensation for unemployment. An appendix compares the grid tariffs in force in Mid-East England, Central Scotland, and South-East England Areas.

"The Progress of Science," by J. G. Crowther. Pp. 303; illus. London: Kegan Paul, 12s. 6d. This book is intended for the general reader who wishes to take an intelligent interest in recent scientific developments. Its range is wide as it includes neutrons, quantum mechanics, expansion of the universe, cosmic rays, diplogen, and theories of evolution. The author takes for granted a high level of general education in his readers, and the book, although popular in character, can be regarded as a serious introduction to the elements of the different subjects treated. It will appeal to many who have had a scientific training in other fields.

The new edition of "Laxton's & Lockwood's Builders' Price Book" (Kelly's Directories, Ltd., 7s. 6d.) has been carefully revised to bring the prices up to date, and particulars of new products and processes have been included. Alterations have also been made to facilitate reference.

An unconventional book called "Notes on Cement and Reinforced Concrete" has been written and published for sale at cost price (7s. 6d.) by the Ketton Portland Cement Co., Ltd., through Sir W. C. Leng & Co. (Sheffield Telegraph), Ltd. The object of the book is to encourage the use of high-class reinforced concrete for all suitable structures.

Parliamentary News (BY OUR SPECIAL REPORTER)

ON March 27th, in the House of Lords, a Bill was introduced to authorise the Central Electricity Board to make arrangements with certain undertakers. The Bill was read a first time.

Clause 1 of this Bill seeks to authorise the Central Board to make arrangements with authorised undertakers owning non-selected generating stations for regulating the manner in which and the purpose for which such stations shall be operated; for closing down such plant; and for the supply of energy to and from such undertakers. In other words, more flexibility is sought in negotiations while establishing the legality of the procedure and obviating any need for private enabling Bills.

Clause 2 is intended to allow the Central Board, in special circumstances, to supply authorised undertakers at prices and under conditions other than the appropriate terms fixed by Sec. 11 of the 1926 Act, in order to permit persons whose needs are of an exceptional nature to be given an amount of electricity corresponding to the amount so supplied by the Board. Neither of these two provisions would empower the Board to supply directly any undertaker whom it would not otherwise be entitled to supply.

Clause 3 has been inserted at the request of the Electricity Commissioners, as an amendment of Sec. 12 of the 1926 Act, to enable them to modify the method of computing the transmission charges and allowances to be included in the price to be charged for indirect bulk supplies in certain special cases.

Clause 4 seeks to empower the Central Board to supply electricity directly to any railway company. This is a new provision, but should not materially change procedure which has already been followed. It is designed to permit the Board, with the consent of the undertakers concerned, to negotiate a single agreement for the supply of power for the whole of a line, thus relieving the railway company of making separate terms for each point of supply along the route. An arrangement of this nature had already been made in the case of the recent extensions of the Southern Railway's electrified system.

Stockport Corporation Refused Extra Powers

The Stockport Corporation Bill was considered on March 27th by the Select Committee of the House of Commons on Unopposed Bills. Capt. R. C. Bourne (Oxford, U.) presided. Included in the Bill were clauses giving the Corporation the right to cut off supplies of electricity from consumers with unpaid accounts, and to recover the cost of so doing.

The chairman said that since the Bill was introduced similar clauses had been struck out of a public Bill in committee. These clauses therefore must be deleted. The clauses were accordingly struck out.

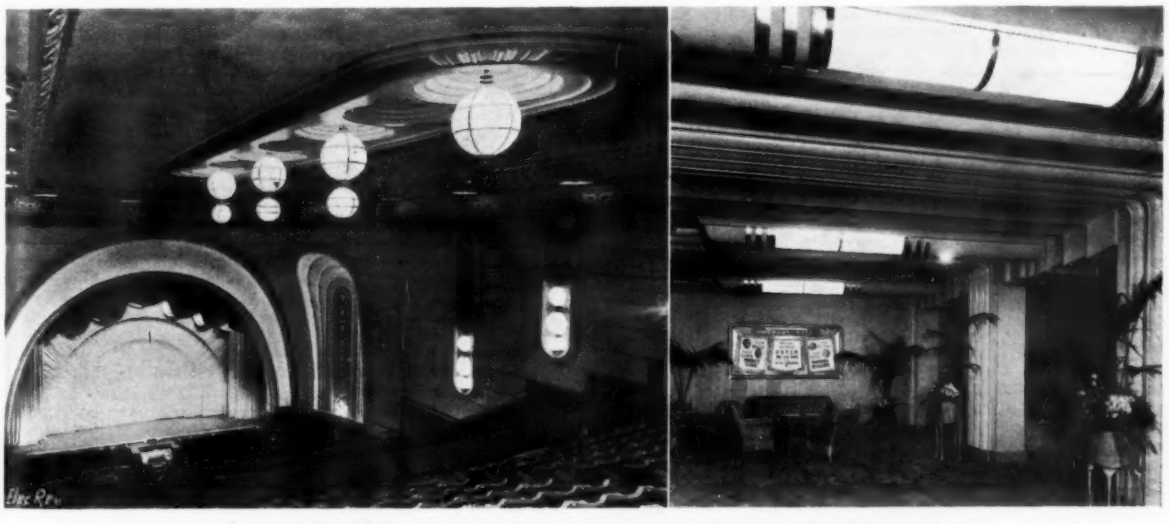
A clause enabling the Corporation to supply electricity to premises partly within and partly without its area was approved.

Port Dinorwic Electricity Order

The Port Dinorwic Electricity Order was discussed on March 27th by the Special Orders Committee of the House of Lords. Lord Onslow presided. On this there was a special report from the Electricity Commissioners, and the Chairman said he gathered that the Gwyrfai District Council, whose area was in part affected, objected to the applicants being granted the Order because a neighbouring undertaking associated with them had not carried out development.

Mr. D. S. Cumberlege, representing the Electricity Commissioners, said they thought that the granting of the Order would produce the results which the Council sought to obtain. The Council had carried its objection to the Ministry of Transport, who ordered a local inquiry and upheld the Order. The Council had not objected since then.

The Order was reported to the House for affirmative resolution.



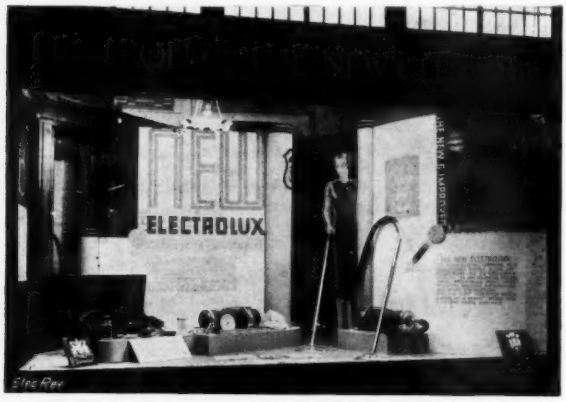
Some of the lighting of the new Gaumont Palace, Wood Green **(See next page)**

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

An Electrical Exhibition at Southend

On Wednesday next, the third annual electrical exhibition organised by the Southend-on-Sea Corporation Electricity Department will open at the Kursaal and will continue until April 19th. The guests on the opening day will include Sir William Ray, and Sir Percival Bower, president of E.D.A. Mr. A. C. Johnson, the borough electrical engineer and manager, informs us that the exhibition will mark the inauguration of simple hire and free hire. An all-electric bungalow will form the chief



A spring window display at the Electrolux headquarters in Regent Street, W.

feature, and there will be in addition about fifty exhibitors. The attractions will include Marconiphone stagecraft, a cable-braiding machine, and demonstrations of electro-plating.

A New Suburban Cinema

Palatial cinema theatres continue to arise in all parts of London. One of the latest is the Gaumont Palace, Wood Green, designed by Mr. W. E. Trent, F.R.I.B.A., assisted by Mr. E. Tully, A.R.I.B.A., and opened last week. It goes without saying that electricity plays an important part in the decorations and services of the new building; the extensive installation was carried out by Messrs. Troughton & Young, Ltd., to the design and instructions of Mr. S. Hart, A.M.I.E.E., the Gaumont British chief electrical engineer. About 5,000 lamps are employed in the elaborate illumination scheme and there is over 100,000 feet of conduit in the installation. The nature of the lighting can be gauged from the illustrations on page 495. Among the suppliers of electrical equipment were the following: The General Electric Co., Ltd. (secondary lighting system); the Strand Electric & Engineering Co., Ltd. (stage lighting equipment); and Callender's Cable & Construction Co., Ltd. (cables).

E.D.A. Activities

The National finals in the Public Speaking Competition organised by the British Electrical Development Association will be held at the Caxton Hall, Westminster, S.W., on April 13th at 7.30 p.m. The judges will be the Dowager Lady Swaythling, Sir James Hawkey, J.P., Mr. J. M. Kennedy and Mr. G. S. Francis. The competitors are the winners in area competitions held in the London and South-East England, South Midland, South-West, Northern Counties, North-West, South Wales and Monmouthshire and Scottish Areas of the Association.

The April sales and publicity programme of the Association reports the excellent progress which is being made in the electric cooking and water-heating campaign. An advertisement, which will appear in a special page of the *Daily Mail* during the Ideal Home Exhibition, is illustrated. A new departure is made in the window display for the month, which shows a bride surrounded by electrical gifts. This display links up with the advertisement which is appearing during the current month throughout the national Press. A new 30-in. by 20-in. poster is illustrated advocating the use of electricity for spring cleaning. The usual price list of literature is included while particulars are given of whist and bowls scoring cards which the Association has produced.

Some More Electric Flats

The electrical installation of the twenty-seven flats in Melina Court, St. John's Wood, N.W., which are illustrated on page 489, consists of lighting, cooking, refrigeration and heating, the apparatus in each flat being as follows: A 6¼-kW Jackson electric cooker; an Electrolux air-cooled refrigerator; a 2-kW inset fire in the living room, and two portable 2-kW fires for bedrooms, &c. Power points are provided in every room for domestic appliances. The supply is taken from the St. Marylebone Corporation's mains and brought into the building at 240/415 V, 3 phase, 4 wire. A 500-A 3-phase and neutral circuit-breaker controls the whole installation. From this circuit-breaker bare copper mains on insulators suitably encased are run up the building and thus amply provide for all requirements of lighting, heating, cooking and power. From these rising mains, cables in screwed conduit are taken to 60 A switch-fuses in each flat.

All the electrical apparatus is provided free by the landlord, being supplied by the supply authority, the tenant paying only for energy consumed at ¾d. per kWh. The wiring is all in screwed conduit, with flush switches, &c. The staircase lighting is connected to a Venner electrically wound time switch, controlled by pushes on the various landings and entrances; the pressing of any of the pushes operates the time switch, which is set for switching on and off for a period of approximately three minutes. The boilers for the hot water supply are coke-fed by means of electric motors electrically controlled. The electric lift by Messrs. Marryat & Scott operates direct on the a.c. supply. The installation is the work of the Berkeley Electrical Engineering Co., Ltd., London.

Combined Gas and Electricity Showrooms

The provision of a joint gas and electricity showroom is to be considered by Thornton Cleveleys Urban District Council. The Electricity Committee has arranged to hold an electrical exhibition.

J. & P. Branch at Bradford

A new branch of Messrs. Johnson & Phillips, Ltd., will be opened at 6, Town Hall Street, Bradford, on April 16th (telephone: Bradford 3956). Full stocks of standard v.i.r. cables will be available for customers in the Bradford area. The office and stores will be under the management of Mr. Robertshaw.

Metropolitan-Vickers Overseas Association

This Association held its annual dinner at the Midland Hotel, Manchester, on March 26th. The president, Mr. J. S. Peck, was in the chair and the chief guest was Mr. F. H. Nixon, C.B., chief of the Export Credits Guarantee Department. Mr. A. McKinstry, director of Babcock & Wilcox, Ltd., was also present. In replying to the toast of the guests, Mr. Nixon said that dealing with trade all over the world as he had to do it had come to his notice that British electrical engineering products ranked high for quality in the world's markets and that the name of the Metropolitan-Vickers Electrical Export Co. was one of the best known and highly accredited in electrical engineering abroad. The existence of the Export Credits Guarantee Department had been prolonged for a further term of five years by the Government with the unanimous support of all sections of the House of Commons.

Electrical Development at Birmingham

At the luncheon of the Birmingham Rotary Club on March 26th, Mr. E. J. Jennings (secretary and commercial manager of the Birmingham City Electric Supply Department) gave an address on the development of the Corporation electricity undertaking: and, in the discussion, Mr. F. Forrest (city electrical engineer) announced that extensions were contemplated at the Hams Hall power station at an estimated cost of £1,000,000. Mr. S. T. Allen (Central Electricity Board) said that Hams Hall was a "pivotal" station, and would be a central feature in the scheme to supply his area.

Modern Lighting of Watling Street

Part of the famous old Roman highway, Watling Street, is now illuminated by means of Mazda "Mercra" lamps. A stretch of the road at Dordon, midway between Tamworth and Atherstone, was chosen for the installation. This stretch is typically country road, and no buildings flank the sides to lend additional light, the woodland surroundings tending to accentuate the darkness. The lanterns used in conjunction with these are of the B.T.-H. "Diral" type, and these are mounted on standards at a height of 25 ft. The spacing between the standards is 180 ft. and the width of the roadway proper is 24 ft. The lighting on the road surface over the whole stretch of road is very even.

Wireless Patents in Australia

It is reported that negotiations are taking place regarding an agreement for the general use by local manufacturers of current patents relating to wireless reception. At present these patents are held by two separate groups. One is the Australian Radio Technical Services and Patents Co., Ltd., which has the exclusive right to grant in Australia licences for the manufacture, sale or use of broadcast receivers under the patents owned by several companies which include Philips' Lamps, Standard Telephones and Cables, Western Electric Co., and Marconi's Wireless Telegraph Co. The second is the Hazeltine group. The first group charges for the use of its

patents 3s. 6d. for each effective valve employed in a receiver. The second group charges 5s. for each receiver employing its patents. Each group undertakes to supply a receiver which does not infringe the patent rights of the other, while the trade claims that it is possible to make a set which does not infringe the patents of either. Sales tax is also chargeable on payments made for the use of patents, and altogether these charges, it is stated, increase the price of the popular sets by about £2. Local makers of sets desire to have all the patents made freely available so that they may be combined without unduly burdening the industry with the cost of royalties.

A petition was heard recently by the Federal Attorney General (Mr. Latham) for a fiat to enable four companies to present a petition to the High Court for the revocation of certain wireless patents in the name of the Hazeltine Corporation (U.S.A.), Ltd., and Neutrodyne, Pty., Ltd. The petitioners were New System Telephones, Pty., Ltd., Airzone (1931) Ltd., A. G. Healing, Ltd., and Electrical Meters, Ltd. The patents concerned are in respect of wireless receiving sets. The grounds on which the petition was based were that the patents in question were void for want of novelty and subject matter. Opposition was on the ground that proceedings alleging infringement of the patents were already pending in the Supreme Court of Victoria, and in this case the issue of validity was raised. Mr. Latham reserved his decision.

The Manchester Central Reference Library

We should have mentioned in our article last week that the photograph of the exterior of the new Manchester Central Reference Library was taken for *The Architect and Building News* by whose courtesy it was reproduced.

Recent Contracts

Among the contracts recently secured by Messrs. Ruston & Hornsby, Ltd., are orders for four six-cylinder, 180-b.h.p. engines, two three-cylinder, 90-b.h.p. engines, two twin-cylinder engines of 60 b.h.p., and three five-cylinder 58-kW lighting sets for the Government, four eight-cylinder, 600-b.h.p. engines for the Canton Government cotton mill, and a 300-b.h.p. engine for electric lighting in the Rajpipla State. Orders have also been received for a number of engines for various waterworks.

The Government of India has placed a contract with Sir W. G. Armstrong Whitworth and Co. (Engineers), Ltd., Scotswood-on-Tyne, for two 1,300-b.h.p. Diesel-electric locomotives.

An order recently received by the British Thomson-Houston Co., Ltd., from the London Passenger Transport Board covers twenty-six electric control equipments and motor-driven compressors for motor coaches for service on the Piccadilly Railway. These equipments will be duplicates of the 145 B.T.-H. electric control equipments and compressors previously supplied for motor coaches in service on the western extension of the Piccadilly line from Hammersmith to Boston Manor, and the northern extension from Finsbury Park to Cockfosters.

An important non-electrical contract of the week is the £300,000 order placed with the North British Locomotive Works, Glasgow, for locomotives for the South African Railways.

Social Event

At the first dinner-dance to be held by the Electricity Department of the Taunton Corporation, Mr. A. J. Howard, borough electrical engineer, was congratulated by the Mayor, Mr. William Brake, on the fact that he had occupied this position for a period of twenty-five years. The Mayor said the electricity undertaking continued to make steady progress, and in the current period sales had increased by 20 per cent. Taunton still held the position of being the station with the lowest coal consumption per kWh generated compared with stations of similar size throughout Great Britain. The dinner-dance was well attended, the electrical trade being strongly represented.

A Peruvian Radio Market

A report on the market for radio apparatus in Peru, furnished by the Commercial Secretary to H.M. Legation at Lima has been issued by the Department of Overseas Trade. This states that there is no local manufacture of radio apparatus in Peru and very little sale for radio parts as the number of local amateurs is limited. Imports of sets and component parts from the United Kingdom for private use are comparatively small, those shown in the Customs statistics being almost entirely destined for the technical requirements of the Marconi Co.'s wireless telegraph system. This market is almost entirely supplied by United States manufacturers and to a small extent by Philips in Holland. For the moment the decline in the value of the United States dollar practically shuts United Kingdom manufacturers out of this market. When more favourable exchange conditions arise and more attention is paid to short-wave receivers by United Kingdom manufacturers the latter should be able to find a limited opening in Peru, particularly as regards battery-operated sets for use up-country.

A Wrong Number

In the Trade Names Supplement included in our last issue the address of the Tudor Accumulator Co., Ltd., was given as 59, Grosvenor Gardens, S.W.1. The correct number is 50.

Swiss Electrical Exports

The exports of electrical apparatus and instruments from Switzerland during the past year attained a value of £687,520, as compared with £659,920 in 1932.

The Manufacturers' Agents' Association

The annual meeting of the Manufacturers' Agents' Association of Great Britain and Ireland was held at the Mercantile Exchange, E.C., on March 13th, when Mr. J. Joy was re-elected president of the Association. The other officers and members of the Council were also re-elected.

Brighton Corporation and Contractors

An agreement has been reached between the Brighton electrical contractors by which sales of apparatus effected at the Corporation showrooms to consumers introduced by contractors shall carry for the latter a commission of 25 per cent. where manufacturers' terms are ordinarily 33 per cent. discount, and 20 per cent. where the ordinary terms are 25 per cent. discount. When a contractor orders directly he will receive 33 per cent. and 25 per cent. respectively. When a sale to a consumer is made without a contractor's introduction a contractor undertaking the wiring will receive 10 per cent. The definition of "Electrical Contractor" agreed upon is a trader who is on the National Register of Electrical Installation Contractors, or a member or associate member of the Electrical Contractors' Association.

Italian Foreign Electrical Trade

The appended table shows the Italian imports and exports of electrical machinery and apparatus during the whole of the past year, as compared with 1932. It will be seen that the imports show a decrease of £562,781, or over 48 per cent., and the exports a falling-off of £717,665, or about 25 per cent.

	Imports.		Exports.	
	1932. lire (thousands)	1933. lire (thousands)	1932. lire (thousands)	1933. lire (thousands)
Accumulators and parts ...	974	768	2,290	1,229
Lamp bulbs	1,193	1,505	—	3
Electrical measuring instruments	3,599	3,280	382	143
Radio apparatus	19,891	17,526	3,875	2,677
Telegraph and telephone apparatus	40,674	29,440	24,422	12,254
Misc. electrical apparatus ...	27,587	16,447	2,410	1,801
Electric furnace and other carbons	6,350	5,164	212	197
Insulated cables	817	316	3,334	1,386
Electricity meters	2,624	2,573	528	764
Insulated wire	998	884	4,346	2,983
Generators and motors "without collectors"	8,434	7,451	4,725	862
Generators and motors "with collectors"	14,609	10,064	22,958	13,216
Glass and porcelain insulators	333	489	1,177	791
Arc lamps	77	39	—	13
Incandescent lamps	7,931	6,057	1,336	1,159
Static transformers	3,370	2,438	12,139	1,598
Insulating tubes	21	24	46	44
Total lire	139,482,000	104,525,000	84,180,000	41,120,000
Total at 60 lire to the £	£2,324,866	£1,742,085	£1,403,000	£685,335

Revo Factory Extensions

The accompanying illustration shows the extensions now being added to the present electric cooker factory of the Revo Electric Co., Ltd., at Tipton, Staffs. This four-bay shop in which the entire range of Revo electric cookers is assembled is now being increased, and, when completed,

An extension of the Revo factory in course of erection

will measure 900 ft. by 160 ft., and the company claims that it will be the largest shop devoted solely to the assembly of electric cookers in Great Britain. The foundry, machinery bays, and vitreous enamelling plant are also being extended.

Economic Conditions in Mexico

In a report on economic conditions in Mexico, prepared for the Department of Overseas Trade (Stationery Office, 1s. net.), by Mr. T. I. Rees, H.M. Consul-General, Mexico City, it is stated that machinery of all kinds still has to be imported, and machinery, tools, instruments and motor vehicles account for over 25 per cent. of the total imports. The United States is responsible for the greater part of the imports and the exports, Germany and the United Kingdom being second and third respectively, though a long way behind, as regards imports.

During 1931 the principal imports included material for electric power transmission lines to a total of 5,685 metric tons, valued at P$2,926,736; power machinery (generating, transforming, etc.), 3,454 metric tons (P$4,306,125); wireless telephonic and telegraphic apparatus and electric bells, 636 metric tons (P$3,724,888); and material for electrical installations, 968 metric tons (P$2,049,404). It is estimated that the number of generating plants, large and small, in the country, exceeds 900, with a total capacity of over 70,000 h.p., the greater part of which is hydro-electric. The annual production at present is approximately 1,800 million kWh, one-third of which is produced by the Mexican Light & Power Co. It is estimated that the total hydro-electric h.p. available in the Republic is over 10,000,000. The country possesses sixty-four broadcasting stations, of which four are operated by the Government. Owners of receiving sets are not as yet required to pay licence fees, but are expected to register their apparatus. The number of such owners is estimated at 50,000.

Trade Announcements

The Abbey Electrical Co., Ltd., has removed to 53 and 54, Haymarket, S.W.1.

Henry Bacchus, Ltd., 35, High Street, Bedford, on completion of extensive alterations to their premises, have opened an enlarged and newly equipped electrical and wireless showroom.

This week a further movement of staff to their North London premises was made by Messrs. Callender's Cable &

Callender's North London offices

Construction Co., Ltd. The departments concerned are the Underground Contracts, Overhead Contracts, and Railway Electrification Departments, whose address will now be Hillmarton Road, Caledonian Road, N.7. (Telephone: North 0622; telegrams: "Callecon, Holway, London."

Messrs. Johnson & Phillips, Ltd., have appointed Messrs. Hodges & Taylor, 180, High Street, Hull, as their agents for Hull and district.

The Arctic Fan & Electrical Co. has been formed to trade as ventilating and electrical engineers. Messrs. A. Knowles and G. D. Hartigan are the partners, and the address is 48, Beak Street, W.1.

Mr. John Girvan, electrical and wireless engineer, Ayr, has opened additional premises at 246, High Street.

Mr. G. J. Small, electrical and radio engineer, Taunton, has opened new premises at 53, Station Road.

From April 14th the address of International Lamps, Ltd., will be National House, 173-175, Farringdon Road, E.C.1. The telephone number and telegraphic address will remain unchanged.

The J. P. Tubular Heater Co., Ltd., has removed to 24, Percy Street, W.1 (telephone: Museum 6455).

Electricity in the Steel Industry

The use of electricity in the steel industry was referred to by Mr. A. J. Grant, managing director of Thomas Firth and John Brown, Ltd., Sheffield, in a speech at the annual luncheon of the North Midland Area of the British Electrical Development Association at Leeds on March 28th. He said that in the steel industry this country's last chance of maintaining its position in the world was in the domain of high-quality steels, on which a great deal of research was now being done. It was characteristic of these steels that they must be melted electrically, and he could foresee that the demand for electrical energy for metallurgical purposes was bound to grow. His own company expected to call for 50 million kWh a year, a figure which might be doubled in the next five years. Cheap electricity was important for the development of new branches of manufacture. Owing to the lack of it in the past many of the special steels that were becoming so important had been imported from Scandinavia, France, and Germany, where abundant water power made it possible to produce certain alloys which could not be obtained here. With the development of electricity in this country those handicaps would be removed.

Mr. A. C. Cramb, director and secretary of the Association, said that North Country people were complaining that industry was moving south. In the South they made their factories attractive and well lighted. If more were done on the same lines in the North industry would remain there, and electricity could obviously do a great deal to help in that direction. Mr. T. Roles, borough electrical engineer, Bradford, and chairman of the Area, said that one direction in which they hoped to advance in Yorkshire was in the application of electricity to textile mills. At present we lagged behind Continental countries in this respect. Other speakers were Mr. S. E. Fedden, Alderman W. J. Rayment, of Lincoln, and Mr. C. H. Cox. Sir William Ray, who was to have been the principal guest was unable to attend owing to illness.

Ceylon's Electrical Imports

Though figures in most cases show decreases as compared with the previous year, the United Kingdom continued to be the source of practically all classes of electrical machinery and goods purchased by Ceylon in 1933. Imports of radio instruments and apparatus from Great Britain rose from Rs.41,000 to Rs.80,000, out of a total of Rs.107,000 (Rs.77,000 in 1932). Of imports of electric lighting accessories, fittings and switches valued at Rs.225,000 (Rs.57,000 decrease) the United Kingdom supplied Rs.106,000 (Rs.6,000 decrease), while her share of the insulated wire and cable imports amounted to Rs.90,000 (Rs.63,000 decrease) out of Rs.108,000 (Rs.64,000 decrease). The dry-battery market might profitably be given more attention by British manufacturers, since it is at present dominated by the United States, who last year supplied Rs.113,000 out of a total of Rs.169,000 worth; Great Britain's share was only Rs.19,000, which was, however, Rs.12,000 more than in the previous year. The United Kingdom was responsible for nearly the whole of the imports of unenumerated electrical goods and apparatus (Rs.174,000), electric motors (Rs.50,000), and unenumerated electrical machinery (Rs.67,000). Japan's competition was very noticeable last year in lamps and lighting fittings. With regard to import trade generally it is thought that the lowest level was reached last autumn and that the slight recovery which has since set in will continue. It would seem that some influence is being felt from the revival in export trade, which last year was greater in value than in 1932, although less than in 1931.

U.S. Exports of Domestic Appliances

The official trade returns lately to hand show that there was a slight improvement last year in the overseas demand for American domestic electrical appliances, the gross total of the shipments from the United States having attained a value of £1,145,608, as compared with £973,469 in the preceding twelve months. The appended table gives the details of the shipments during the past two years:—

	1932.		1933.	
	No.	Value, £.	No.	Value, £.
Fans	27,095	44,568	26,084	34,000
Household refrigerators ...	37,719	671,915	60,490	894,416
Washing machines	6,710	50,900	3,297	35,781
Irons	55,382	17,328	64,527	18,208
Cooking ranges	1,879	28,121	2,102	31,027
Domestic vacuum cleaners ...	40,646	75,415	19,583	42,116
Other domestic electrical appliances	125,563	85,222	132,440	90,060
Total ...		£973,469		£1,145,608

Points in the table to which attention may be drawn are the increase in the exports of domestic refrigerators, electric irons and cooking appliances, and the falling off in fans and vacuum cleaners.

A "Met-Vick" Calendar

We have received the customary "girl" calendar for April, 1934-March, 1935, from the Metropolitan-Vickers Electrical Co., Ltd. This is the nineteenth of the series, and the subject this time is Miss Betty Thomas, who has been chosen as embodying the spirit of happiness promoted by the passing of the trade depression.

For Manufacturers Only

Messrs. F. J. Gordon & Co., Ltd., of 92, Charlotte Street, London, W.1, who represent Messrs. Hobart Bros. of Troy, Ohio, in this country, wish to get into touch with a firm to take over the manufacture and exploitation of Hobart electric welding plants in this country.

Prices of Materials

Messrs. F. Smith & Co. report April 4th: No change in the price of electrolytic copper bars, wire rods and h.c. wire, and silicium bronze wire.

Messrs. Edward Till & Co. report April 4th: No change in the price of india-rubber, Para, fine.

Messrs. James & Shakespeare report April 4th: No change in the price of copper sheet (best selected), bars and rod, electrolytic copper sheets, and English pig lead.

New Catalogues and Lists

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—Particulars of the Benjamin lightmeter model "B."

English Electric Co., Ltd., Stafford.—A booklet on non-deteriorating high-rupturing capacity fusegear.

Cooper-Stewart Engineering Co., Ltd., 136, Long Acre, W.C.2.—A folder illustrating the "Sunbeam" toaster and waffle iron attachment.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—A booklet on marine control apparatus.

Petters, Ltd., Westland Works, Yeovil.—A list of 5- to 10-b.h.p. Diesel engines.

British Insulated Cables, Ltd., Prescot, Lancs.—Particulars of "Rockbestos" arc light and projector cables.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—A booklet on steel plate fans.

Central Equipment, Ltd., 188, London Road, Liverpool.—A leaflet on the "No-Mast" aerial.

L. Weekes (Luton) Ltd., Luton.—A leaflet illustrating and describing watertight plugs and sockets. A large number of these have recently been installed at the King George V Dock, Southampton.

Watmel Wireless Co., Ltd., Imperial Works, High Street, Edgware.—An illustrated catalogue of potentiometers, volume controls and variable resistances.

Gent & Co., Ltd., Faraday Works, Leicester.—An illustrated booklet dealing with the "Tangent" staff-locating system.

Bankruptcy Proceedings

G. S. Elliott, 70, Rupert Street, Norwich, electrical engineer. —The first meeting of creditors in this matter was held at the Official Receiver's office, 4, Eastbourne Place, Prince of Wales Road, Norwich, when a statement of affairs was submitted showing ranking liabilities of £213 and net assets of £10, leaving a deficiency of £203. Debtor stated that the turnover in his business during the last two years was approximately £5 a week, but the profits had not, at any time, been sufficient to meet his living and working expenses. He added that he realised his position about four years prior to the receiving order. The case being a summary one was left in the hands of the Official Receiver, as trustee.

A. C. R. Birkett, Radio House, 22 and 24, Wheeler Gate, Nottingham, electrical engineer.—This debtor's application for discharge was heard at the County Court House, Nottingham, on March 23rd. The discharge was granted subject to two months' suspension.

I. M. Walker and **D. B. Beavan,** radio and electrical retailers, 2, The Arcade, Swiss Cottage Station, Hampstead, N.W.6.—Receiving order made March 24th on debtors' own petition. First meeting, April 9th, and public examination, May 15th, both at Bankruptcy Buildings, Carey Street, W.C.

T. Ward, radio and battery engineer, 7b, Richmond Street, Bridlington.—First meeting, April 5th, at Bank Chambers, Scarborough. Public examination, April 17th, at the Court House, Scarborough.

H. A. Kaplan, wireless dealer, 89, Elgin Mansions, Elgin Avenue, W.—Trustee, Mr. S. G. Crimes, 150, Southampton Row, W.C., released January 31st.

E. V. Russell (the Skegness Electric Service), 2, Tennyson Buildings, Drummond Road, Skegness.—Last day for receiving proofs for dividend, April 11th. Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver.

R. Baxter, electrician and wireless dealer, 77, Hackthorn Road, Sheffield.—Last day for receiving proofs for dividend, April 11th. Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver.

T. McKnight, electrical contractor and wireless dealer, 2, Brookfield Drive, Swinton.—First meeting, April 6th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, April 18th, at the Court House, Encombe Place, Salford.

R. J. Abrahams, radio dealer, 13, Crosslands Estate, Thundersley, Essex.—First meeting April 13th at 29, Russell Square, W.C. Public examination May 31st at the Petty Sessions House, Southend.

C. I. Morris, radio dealer, 3, Bergholt Crescent, Stamford Hill, London.—Application for discharge to be heard on April 27th at Bankruptcy Buildings, Carey Street, W.C.

A. M. Hyde, electrical and radio engineer, 4, Duke Street, Congleton.—Trustee, Mr. P. M. Milward, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released February 23rd.

F. Finch, radio engineer, 2a, Fishergate Hill, Preston.—Trustee, Mr. H. Parker, 9, Cannon Street, Preston. Official Receiver, released March 5th.

H. M. P. Bridge (Bellhouse Radio and Electrical Salon), 44, Bellhouse Road, Sheffield.—First and final dividend of 2s. 10¾d. in the £, payable April 5th, at 14, Figtree Lane, Sheffield.

Company Liquidations

J. C. Plimpton & Co., Ltd.—Particulars of claims by April 14th to the liquidator, Mr. G. Leather, 24, North John Street, Liverpool.

Budleigh Salterton Electric Light & Power Co., Ltd.—Winding up voluntarily. Liquidator, Mr. D. S. S. Macdowall, 47, Parliament Street, S.W.1.

Burndept Wireless, Ltd.—Meeting, April 30th, at 11, Ironmonger Lane, E.C., to receive an account of the winding-up by the liquidator, Mr. E. Maloney.

Western Counties Electrical & Engineering Co., Ltd.—Meeting, May 3rd, at 23, Baldwin Street, Bristol, to receive an account of the winding-up by the liquidator, Mr. A. Collins.

Private Arrangements

G. T. Theobald, trading as the Balding Electrical Co., 33, Theobalds Road, London, W.C.1, electrical contractor.—A meeting of creditors of the above was held recently at the offices of Mr. P. S. Booth, accountant, Kimberley House, Holborn Viaduct, E.C., when a statement of affairs was submitted which showed liabilities of £400, of which £362 was due to the trade; there were cash creditors for £37 and bank charges amounted to 2s. 8d. The net assets were £105, leaving a deficiency of £295. It was stated that for some time past the debtor had been sued, and there were three judgments outstanding under which creditors were in a position to levy execution. In order to protect the assets a deed of assignment had been executed in favour of Mr. Booth as trustee. The creditors decided to confirm the deed of assignment already executed, and appointed a committee of inspection.

G. W. Breen, radio dealer, 111, London Road, Bexhill-on-Sea. —The creditors of the above met recently at the York Hotel, Bexhill-on-Sea, when the statement of affairs showed liabilities of £340, all due to the trade. The net assets were £339, leaving a deficiency of £1. It was decided that the matter should be dealt with under a deed of assignment to Mr. A. E. Orbell, accountant and auditor, 6 and 7, Old Steine, Brighton, together with a committee. It was also decided that Mr. Orbell should be authorised to sell the estate to the debtor's friends at a price to be determined by the committee.

Electricity Supply

Lighting, Domestic, Power

Australia.—A Sydney Manufacturing Experiment.—Mr. Forbes Mackay, general manager of the Sydney municipal electricity department, has reported that the supply of electricity from the Council's station at Pyrmont during next winter will be uncertain, with the possibility of serious dislocation. This is due to the fact that when he recommended that a contract should be placed with a reliable and experienced overseas firm for the supply of three power transformers for this station the Electricity Committee overruled his advice and decided that the order should be given to a local firm so that experiments might be made in the building of such transformers. The manager now reports that the work on the three transformers is behind schedule. The first has been delivered, but the insulation of the coils has failed under test, and in other respects the transformer fails to comply with the specification, so that it cannot be accepted without amendment. The Electricity Committee has decided to install supervisory control equipment in one sub-station at a cost of £10,780. The cost of installing similar plant in all the large sub-stations would be £95,000.

Barking.—New Sub-Stations.—The Electricity Committee is to lay a feeder and erect a sub-station in the London Road district at a cost of £5,272; to erect and equip a rectifying sub-station in the Lodge Avenue area at a cost of £1,856; and to duplicate the plant at the Park Modern sub-station at a cost of £2,114.

Birmingham.—Extensions.—The Hams Hall generating station is to be extended at a cost of £1,000,000.

Bognor Regis.—Extensions.—The Bognor Gas & Electricity Co. has recently extended its l.p. overhead lines into the parish of Binsted.

Burnley.—Hire-purchase Schemes.—During February the Electricity Department supplied on hire-purchase or hire 137 appliances, connected 170 new consumers, and connected 264 consumers on the rateable-value system. The houses wired under the hire-purchase scheme numbered 1,220, houses wired through slot meters 3,950, and through two-part tariff meters 390.

Extension of Supply.—Following representations by Burnley Rural Council, the Electricity Committee has agreed to supply electricity in Worsthorne, Cliviger, and Holmes Chapel.

Cheltenham.—Loan.—The Electricity Committee has obtained sanction to borrow £15,000 for mains and services, and it is to improve the supply in the Lansdown, Tivoli, Park and London Road districts at a total cost of £16,429.

Chester.—Bulk Supply.—The Electricity Commissioners have declined to give the Electricity Committee permission to supply electricity in bulk to the Hawarden Rural District Council.

Chesterfield.—Extensions.—The Town Council is to lay an extra e.h.p. cable on another route to Whittington Moor to provide an alternative supply in case of emergency, at an estimated cost of £4,350, and to carry out other e.h.p. extensions at an outlay of £1,691.

Rate Relief.—The Electricity Committee recommends the provision of a further sum of £1,000 towards the relief of the rates.

Chislehurst.—Price Reduction.—The Chislehurst Electric Supply Co., Ltd., is to reduce its flat rate charge for lighting from 7d. to 6d. per kWh, and that for heating and cooking from 3d. to 2d. The distribution system in the Chislehurst area is to be entirely reconstructed. The Foots Cray Electricity Supply Co., Ltd., has introduced in its area two-part tariffs for domestic and business premises.

Coventry.—Price Reduction.—The Electricity Committee recommends that reduced charges for domestic supplies shall be put into operation as from the June quarter.

Dover.—Purchase Offer Rejected.—The Town Council has decided to reject offers to purchase the electricity undertaking. One offer was for payment of £250,000 and another far in excess of that amount.

Dock Supply.—The Council has sealed an agreement with Edmund Nuttall, Sons & Co. and John Mowlem & Co. (Joint), Ltd., for supplies of electricity in connection with the construction of the Ferry Dock.

Dumbartonshire.—Wiring Scheme.—The architect's report regarding the electric wiring of the Auchenleck housing scheme has been considered by the Dumbarton County Council. The scheme would cost £210, plus the cost of a cable at from 5s. to 7s. 6d. per yard. The meeting agreed to defer the matter until the cable was laid.

Dumfries-shire.—School Heating.—At the last meeting of the Dumfries-shire Education Committee a report was submitted from a conference of representatives of the Education and Electricity Committees of the County Council relative to the charges for electricity used for heating schools.

Falkirk.—Area Extension.—The Town Council has applied for a Provisional Order for the extension of its area of supply as defined by the Falkirk Electric Lighting Order, 1901. The Order contains provisions as to the supply and use of elec-

tricity, and power for the Town Council to make by-laws as to wires, apparatus, and fittings.

Finchley.—Extensions.—The Electricity Committee is to extend mains at a cost of £1,450; provide a sub-station in the Hampstead suburb area; and extend feeders and plant, at a cost of £11,500.

Glasgow.—Mains.—The Electricity Committee has decided to lay distributing mains at a cost of £3,166.

New Sub-station.—The Committee has authorised the manager to erect a sub-station at Blackhill.

Monthly Progress.—Under the Electricity Department's scheme sixty-four houses were wired in February, making the total to date 38,719, and hired appliances reached a total of 17,398.

Guildford.—Change-over.—The Electricity Committee is to change over the system of distribution in another part of the district, at a cost of £5,580; to extend cables and erect a sub-station at a cost of £860 to improve the supply in the Guildford Park estate district; and to provide supplies at a cost of £270 to an estate at Bellfields, to be developed by Mr. R. C. Whitemore, and at a cost of £1,983 to an estate near Frosbury Farm, to be developed by the Liddington Hall Estate Co.

Hull.—Plant Extensions.—The Electricity Committee has approved a scheme for the extension of the Sculcoates generating station by the installation of a 25,000-kW turbo-alternator set, at an estimated cost of £96,000, and is to provide and equip four sub-stations at a cost of £9,725. The Committee has obtained sanction to borrow £7,350 for the modification of three boilers at the power station, and is to allocate £25,000 from surplus revenue for the domestic apparatus and hire-purchase schemes.

Leicester.—Loans.—The Electricity Committee has asked for sanction to a loan of £8,669, the amount by which the expenditure on the fourth section of the Centre generating station exceeds the estimate. It is also seeking sanction to a loan of £50,000 for extension of mains, to be obtained from time to time as occasion arises.

Lindsey.—Overhead Lines.—The County Council recently decided to raise no objection to the proposal of the North Lincs and Howdenshire Electricity Co., Ltd., to use overhead lines for supplying electricity to Lea, subject to the consent of the Gainsborough Rural Council. The latter body opposes the use of overhead lines, and in consequence the County Council has withdrawn its previous decision, and has requested the company to substitute underground cables.

London.—Battersea.—The Electricity Committee has recommended that the flat rate charge for lighting be reduced from 3½d. to 3d. per kWh; that the "unit" charge for the two-part tariffs be reduced from ¾d. to ⅝d. per kWh; and that the sliding-scale charges for power be extended so that where the quarterly consumption exceeds 10,000 kWh the charge shall be 0.85d. per kWh instead of 0.9d.

The Committee is to provide services to 160 premises, at a cost of £1,429.

The Committee reports that, as a result of negotiations, Messrs. Mark Mayhew, Ltd., have agreed to take a supply of electricity for power and lighting purposes at their flour mill in Church Road, and it will be necessary to carry out works at an estimated cost of £3,575.

The supply to the St. John's Estate district is to be improved at a cost of £4,134.

Bermondsey.—The Electricity Committee has obtained sanction to borrow £14,000 for mains and services, £7,000 for meters, and £14,000 for consumers' wiring installations.

Poplar.—The Borough Electricity Committee is to seek sanction to borrow £14,000 for the installation of a 6,000-kW turbo-alternator to deal with peak loads during the four winter months. The balance of the maximum demand on the undertaking, 23,500 kW, and the whole of the supply at other times will be provided from the grid.

Southwark.—Recently the Borough Council urged the Minister of Transport to take into consideration the expenditure on public lighting of main roads when making grants from the Road Fund. A reply has been received to the effect that the Minister is not in a position to make such grants. The Highways Committee is of opinion that there is justification for urging the Minister to reconsider the matter, and that the application would be strengthened by concerted action with other boroughs, and it therefore recommends that the Metropolitan Boroughs Standing Joint Committee be invited to consider the matter.

The Borough Electricity Committee is to install free wiring at various tenements and dwellings at a cost of £4,191.

Supply to Council Houses.—The London County Council Housing Committee has had under consideration the question of installing electricity in the houses at Downham, the wiring of the houses to be undertaken by the Council, subject to the electricity supply authorities concerned agreeing to extend their mains and services without charge. All the houses are at present lighted by gas, and, of the total of 6,071 houses on the estate, 5,351 are in the area of supply of the South Metropolitan Electric Light & Power Co., Ltd., and the remaining 720 in the Bromley Corporation's area. The South Metropolitan Light & Power Co., Ltd., would be prepared to extend its mains to supply a section only of the estate in its area, in the first instance, as an experiment. No information is at present available as to the number of tenants on the portion of the estate within the county who desire electricity. As regards the portion of the estate in Bromley, however, a petition has been received from the tenants asking for the installation of electricity for lighting and heating. It is understood that the Bromley Corporation would be prepared to extend its mains if the Council undertook the wiring, and there was little doubt that the demand would be sufficient to justify the extension of the mains. The estimated cost to the Council of wiring all the houses on the estate, including lighting and plug points, is £55,000, and, for the portion of the estate in Bromley only, £6,500. The Committee is of opinion that the installation of electricity in the houses in Bromley should be proceeded with, and that the question of dealing with the portion of the estate within the County of London should be deferred. The additional charges to be made to the tenants, to cover the cost of wiring and upkeep of the installation, are as follows: Houses of three, four and five rooms, 3d. a week; two- and three-room flats, 2d. a week.

Manchester.—Progress During January.—The monthly report of the Electricity Department shows that 1,595 new consumers were connected during January and 758 existing consumers applied for additional supplies, bringing the total number of applications to 2,353, representing 4,197 kW. During December there were 1,599 new consumers and 714 additional supplies, giving a total of 2,313 and a maximum demand of 4,044 kW. Two hundred and five orders for cookers on hire were received and 194 were connected, which brings the total on circuit to 12,508. The corresponding figures for hired wash-boilers were 16, 21, and 595 respectively.

Sheffield.—Important Extensions.—Capital expenditure of £770,000 by the Electric Supply Committee has been approved. This will be used for the extension of plant at the Neepsend and Blackburn Meadows generating stations by the installation of one 30,000-kW turbo-alternator with boilers and auxiliaries at the Neepsend station, and similar plant at Blackburn Meadows. Authority is also to be given to proceed with the laying of a h.v. feeder cable, with a capacity of 15,000 kW, from the Blackburn Meadows station to a sub-station at Heeley, at a cost of £78,600; also a new e.h.p. feeder from Blackburn Meadows to a sub-station at Tinsley at a cost of £7,987.

South Africa.—New Transvaal Schemes.—The Town Council of Roodeport-Maraisburg is considering a scheme for augmenting the electricity supply at a cost of £35,000. Krugersdorp Council has ordered plant for its supply scheme, which is to cost £37,000.

Supply Commission's Developments.—It is reported that the Electricity Supply Commission is about to offer for public subscription £6,750,000 of debenture stock at 3¾ per cent. issued at £98. Of the total, £5,750,000 will be used to repay the amount borrowed from the Government at 5 per cent., and the balance will be used for development work.

Tynemouth.—New Equipment.—On the suggestion of the electrical engineer, the Town Council has decided to lay another h.p. feeder cable from the electricity works to the Preston sub-station. Application is also to be made to the Electricity Commissioners for sanction to borrow £919 for the erection and equipment of a sub-station at Chirton.

Uruguay.—Hydro-electric Project.—Notices have recently appeared in the Uruguayan Press to the effect that the plans for the proposed construction of a hydro-electric plant on the Rio Negro are now available at a cost of 100 pesos (about £8 15s. at current exchange rates). The notice further states that a call for tenders on these plans will be issued in due course. The Canadian Trade Commissioner reports that the development referred to has been under consideration since 1912, when investigations were carried out, at the request of the Government, to ascertain the possibilities of economical hydro-electric power production on the Rio Negro. Further investigations were made from time to time, as a result of which several favourable reports were drawn up. Finally, in April, 1933, an engineering commission was appointed to make a definite study of the location, and in July of the same year another commission was delegated to investigate ways and means of financing the scheme. The report of the latter commission has now been published, and is in favour of the immediate construction of a hydro-electric plant on the Rio Negro capable of generating 530,000,000 kWh per annum. It is estimated that the construction would be finished in 1939, and that, allowing for the present rate of increase in electric power consumption, the industrial and agricultural development of the Republic would absorb this total estimated output by that year. Under date February 15th, 1934, a law was passed, based on the findings of the special commission, which authorises the Government to issue bonds to the total value of 48,000,000 pesos for the construction of this development, in accordance with the plans and investigations already carried out. These bonds will bear interest at 6½ per cent. per annum, with 1 per cent. annual amortisation. It is further decreed that the bonds should carry as guarantee the total properties belonging to the State Electric and Telephone Company, with the subsidiary guarantee of the State itself. (The Uruguayan peso is worth 4s. at par and about 1s. 9d. at the current rate of exchange.)

Wayland.—Extensions.—The East Anglian Electric Supply Co. has informed the Rural District Council that preliminary surveys have been made, and a scheme prepared to carry an overhead line from Botesdale to East Harling and New Buckenham, to supply seven or eight villages, including Ban-

ham and Kenninghall, at an estimated cost of £18,500. The company is awaiting the official approval of the Electricity Commissioners.

Wimbledon.—Loans Sanctioned.—The Electricity Committee has obtained sanction to borrow £15,000 for domestic electrical apparatus for hiring and £6,840 for new sub-stations and equipment.

Winchester.—Extensions.—The Wessex Electricity Co. has applied for permission to erect overhead lines from Houghton to Sparsholt, with l.p. mains in the latter village. The Rural District Council has decided to raise no objection.

Wrexham.—Overhead Lines.—The Rural Council has given consent to the use of overhead lines by the North Wales Power Co., Ltd., and the Electricity Distribution of North Wales and District, Ltd., for supplying electricity to Brymbo steel works, Little Mountain, Gwersyllt, and Bwlchgwyn and Plas Gwin Mountain.

Traction

Aberdeen.—Trolley-buses.—The Provisional Order, which has now been published, will empower the Corporation to provide trolley vehicles along the route of any tramway and along such other routes as may be sanctioned by the Minister of Transport. The Order will also authorise the Corporation to supply electrical energy from its electricity undertaking for lighting, power, therapeutic treatment, and other purposes to its Kingseat Mental Hospital.

Blackpool.—Tramway Traffic.—The transport manager (Mr. W. Luff) has issued figures which show that in eleven months the tramways carried 42,182,923 passengers, a considerable increase on the previous year. There was an increase in receipts of £31,821, these being up by 0.58d. per mile. In February 165,652 more passengers were carried by the tramcars than in February last year.

Great Britain.—Trolley-bus Progress.—Trolley-omnibuses are running on 346 miles of route and thirty miles of route are under construction. The number of trolley-omnibuses in service is 891 and a further ninety-five are on order, making a total of 986.

In a table showing the twenty-nine trolley-omnibus undertakings in operation or under construction, prepared by *The Transport World*, Wolverhampton Corporation, which has abolished tramways entirely, heads the list with a route length of nearly forty-six miles and 105 vehicles. The South Lancashire Transport Company comes second with twenty-seven miles and forty-six vehicles, but Nottingham Corporation will shortly take its place when the thirteen miles of route under construction are completed. Its mileage will then amount to twenty-eight, with 106 vehicles.

United States.—Electric Car Heating.—A new car just delivered to the Chicago Surface Lines is equipped with a special type of electric heater fitted in an air duct arrangement. The heater has two elements: one of 5 kW, which is constantly in circuit, and one of 10 kW, which is used as required.

Weston-super-Mare.—Trolley-buses.—If double-decker buses were allowed to run on the sea-front at Weston-super-Mare it would be disastrous to the tramways, and could only lead to the closing down of the system, said Mr. A. Wridley, business manager of the Weston-super-Mare tramways at Bridgwater, when the Bristol Tramways and Carriage Company applied before the Western Traffic Commissioners for permission to run a double-decker 'bus service. Sir Duncan Grey said that the tramway system reduced the bill for electric light and power, as the company was able to utilise its energy for the tramway system. The Commissioners granted the application.

Communications

Canada.—Telephone Statistics.—The Dominion Bureau of Statistics at Ottawa reports that 1,261,245 telephones were in service in Canada in 1932, a decline of 7.5 per cent. during the year and of 10.1 per cent. as compared with the record achieved in 1930. The Dominion has now twelve telephones per 100 of population. Gross revenues amounted to $60,684,992, a decline of $6,121,588, while expenses were reduced from $60,067,016 to $55,344,023.

Cornwall.—A Historic Radio Station.—Unusual interest is attached to the announcement that the wireless station at Poldhu, near the Lizard, is to be closed down at the end of this month. With the centralisation of research there will be no further use for this pioneer station, which transmitted the first transatlantic morse signals received by Senatore G. Marconi in Newfoundland. It was also one of the first stations to transmit radio-telephone messages from England to America.

France.—Photo-telegraphy.—The British Post Office announces that the facsimile picture telegraph service between this country and France has been extended to the provincial towns of Bordeaux, Lyons, Marseilles, Nice, and Strasbourg. Hitherto pictures have been transmitted from France to England only through the Paris central telegraph office.

India.—Telegram Rate Increase.—The Government of India proposes to increase the rates for express telegrams from one rupee for 48 words to one rupee for 40 words, and for ordinary telegrams from eight annas for 48 words to eight annas for 40 words, for newspapers, news agencies, and smaller papers dependent on them. The copying fee will be six annas per hundred words.

Great Britain.—Radio Interference.—In the House of Commons on March 28th Captain Evans asked the Postmaster-General if his department had been able to persuade users of electrical equipment and appliances to prevent unnecessary interference with wireless reception, or whether he contemplated introducing legislation to give effective legal authority to enforce the recommendations of the Post Office engineers dealing with such interference. Sir E. Bennett, Assistant Postmaster-General, said that in the majority of cases owners of electrical apparatus which caused interference were willing to fit remedial devices when their attention was called to the need for such action. The whole subject was at present under consideration by a committee appointed by the Institution of Electrical Engineers. Whether there was any need for legislation would be considered when that committee's report was received.

Loud Speakers in Private Houses.—On March 29th Mr. Harcourt Johnstone asked the Home Secretary whether, in view of the nuisance to their neighbours caused by the users of wireless and gramophone loud speakers in private houses, he proposed to take any steps to control the hours at which such instruments might be used. Sir J. Gilmour said that representations had been made to him as to the nuisance caused to residents in some urban areas, and he had decided that the matter could properly be dealt with by a bylaw under Section 23 of the Municipal Corporations Act, 1882. It was hoped to have available shortly a form of bylaw on the subject suitable for adoption by local authorities where there was adequate evidence of the existence of this nuisance.

Wired Wireless.—When the House of Commons meets after the Easter recess an attempt is to be made to amend the Electricity (Supply) Bill, which is now awaiting its third reading, so as to give electricity supply undertakings power to relay radio programmes over their electricity distribution mains. Recent efforts of the Cardiff and Middlesbrough Corporations to obtain such powers for their municipal electricity undertakings were not successful.

The new electrical train indicator at Paddington station. Left: The control board and miniature indicator panel. Centre: The arrival indicator in the main concourse of the station. Right: The magazine control frame and common apparatus rack (See page 509)

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Ardrossan (AYRSHIRE).—April 16th. Town Council. Various works, including electric lighting, at eighty-four houses. Specifications (£1 1s.) from, and tenders to, Joint Town Clerks, Burgh Chambers.

Australia.—PERTH.—April 19th. Western Australian Government Electricity Supply. Boiler house equipment, one 25,000-kW turbo-alternator and e.h.p. and l.p. switchgear. (February 2nd.)

BRISBANE.—June 8th. City Council. Traction sub-station equipment. (A.Y. 12283.)*

MELBOURNE.—April 17th. Posts and Telegraphs Department. Metal jointing sleeves. (A.Y. 12308.)*

Cardiff.—April 23rd. Electricity Department. E.h.p. and l.p. switchgear and e.h.p. and l.p. cables. (See this issue.)

Dagenham.—April 27th. U.D.C. Electrical wiring, fittings, &c., at the new branch library. (See this issue.)

Dover.—April 18th. Corporation. Cable, distribution lines, &c. (March 23rd.)

Dunbar.—April 11th. Town Council. Various works, including electrical, at housing scheme. Specifications from architects, Messrs. Kininmonth & Spence, 16, Rutland Square, Edinburgh (deposit £1); tenders to Town Clerk.

Dunfermline.—April 23rd. Town Council. Various works, including electric lighting, at forty-four houses at Baldridgeburn. Schedules from Mr. D. H. Shaw, burgh engineer, City Chambers (deposit £1 1s.); tenders to Town Clerk.

Glasgow.—April 10th. Corporation. Materials, including electrical fittings and cables, for Housing Department. Specifications from Director of Housing, 20, Trongate; tenders to Town Clerk.

April 19th. Corporation. Various works, including heating and electrical work, at police training centre, Nicholson and Oxford Streets. Schedules, &c., from Master of Works Department, City Chambers (Room 81) (deposit 2 guineas); tenders to Town Clerk.

Halifax.—April 14th. Corporation. Traffic control signals. (March 30th.)

India.—TRAVANCORE.—June 4th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c. (February 9th.) Date extended from May 7th.

NEW DELHI.—April 23rd. Indian Stores Department. 7,500 yds. three-core paper-insulated lead-covered cable. (A.Y. 12302.)*

SIMLA.—May 10th. Indian Stores Department. Five oil-cooled power transformers. (A.Y. 12305.)*

New Zealand.—WELLINGTON.—Posts and Telegraphs Department. April 18th. 1,000 switchboard plugs and 2,500 24-V switchboard lamps. (A.Y. 12218.)*

April 30th. Eighteen double-pole, single-throw contactors. (A.Y. 12250.)*

May 7th. Thirty-seven moving-coil milliammeters and one voltmeter. (A.Y. 12272.)*

Public Works Department. May 29th. One 33-kV oil-immersed circuit-breaker. (A.Y. 12276.)* Three single-phase potential transformers. (A.Y. 12274.)*

June 26th. Battery-charging equipment. (A.Y. 12273.)*

May 8th. 6-V secondary batteries. (A.Y. 12244.)*

May 1st. Transformer oil drying and testing apparatus. (A.Y. 12252.)*

May 22nd. Battery-charging equipment. (A.Y. 12249.)*

June 5th. 50-V storage battery and charging equipment. (A.Y. 12245.)*

May 8th. Three 63,500/63.5-V oil-immersed self-cooled transformers. (A.Y. 12303.)*

Northern Ireland.—BELFAST.—April 6th. Electricity Department.—Transformers and e.h.p. switchgear. (March 9th.)

April 6th. Improvement Committee. One 50-b.h.p. three-phase 400-V induction motor with power factor correcting device and complete with switchgear. Town Clerk (deposit £1 1s.).

April 17th. Board of Guardians. Electric heating, lighting and passenger-lift installations in new Maternity Hospital. Clerk of Union, Lisburn Road, Belfast (deposit £2 2s. each specification).

South Africa.—DURBAN.—April 13th. Corporation. Telephone cables. (A.Y. 12289.)* 1,000 bobbin insulators and 200 g.i. double-pole brackets. (A.Y. 12286.)* Telephone materials. (A.Y. 12290.)*

CAPE TOWN.—April 18th. Electricity Department. Power and telephone cables. (A.Y. 12299.)*

JOHANNESBURG.—April 19th. City Council. Two 400-kVA transformers. (A.Y. 12297.)*

PORT ELIZABETH.—April 12th. Municipality. Cables, transformers, motors and fans. (A.Y. 12285.)*

PRETORIA.—May 4th. Government Supplies Board. Four-cord circuit repeaters. (A.Y. 12298.)*

Stoke-on-Trent.—April 11th. Electrical Engineer's Department. Overhead transmission lines. (March 16th.)

Tredegar.—April 10th. U.D.C. Pole lines, underground cables and sub-stations and equipment. (March 30th.)

Warrington.—April 16th. Electricity Department. Transformers. (March 30th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aberdeen.—Corporation Electricity Committee. Accepted. Cables (£12,000).—British Insulated Cables, Ltd. This was the lowest of thirteen tenders, all of which came from English firms.

Cheltenham.—Highways Committee. Accepted. Automatic traffic signals (£437).—Automatic Electric Co., Ltd.

Chesterfield.—Electricity Committee. Accepted. Three truck-type cubicles (£508).—British Thomson-Houston Co., Ltd. Economiser renewals (£699).—Clay Cross Co., Ltd. Cables (£3,281).—Macintosh Cable Co., Ltd.

Dover.—Town Council. Accepted. Supplies for one year. Cables.—Pirelli-General Cable Works, Ltd. Meters.—Metropolitan-Vickers Electrical Co., Ltd. Transformers.—British Electric Transformer Co., Ltd.

Finchley.—Electricity Committee. Accepted. Supply and laying of cables for three years.—Callender's Cable & Construction Co., Ltd.

Glasgow.—Education Committee. Accepted. Installation of automatic bell-ringing apparatus at Shawlands school (£82).—D. A. McLarty and Co.

Transport Committee. Accepted. Control switches.—Metropolitan-Vickers Electrical Co., Ltd.

Hull.—Telephones Committee. Accepted. Kirkella automatic exchange (£6,030).—Standard Telephones & Cables, Ltd. Loading coils (£1,119) and auto c.b. telephones (£100).—Automatic Electric Co., Ltd. (plus £25 per week for installing). Cable (£2,226).—British Insulated Cables, Ltd. Bronze wire (£273).—F. Smith & Co.

Leeds.—Electricity Committee. Accepted. Meters for twelve months.—Measurement, Ltd.

London.—BERMONDSEY.—Electricity Committee. Recommended. Switchboard (£726).—A. Reyrolle & Co., Ltd. Switch panel for Minto Street sub-station (£63) and panel for Almond Road station (£67).—Crompton Parkinson, Ltd.

HAMMERSMITH.—Electricity Committee. Recommended for twelve months. Insulated compound.—Dussek Bitumen and Taroleum, Ltd. Electrical goods.—William Maxwell & Co., Ltd. Cables.—Metropolitan Electric Cable and Construction Co., Ltd. House service and joint boxes, &c.—W. Lucy & Co., Ltd. Insulated wires.—Mersey Cable Works, Ltd. Meters.—Aron Electricity Meter, Ltd.; Metropolitan-Vickers Electrical Co., Ltd. Meter boards.—Thermega Ltd.

Manchester.—Electricity Committee. Recommended. Water-cooling tower.—Fred Mitchell & Son, Ltd. 33-kV switchgear.—British Thomson-Houston Co., Ltd. Two 25,000-kVA transformers.—Metropolitan-Vickers Electrical Co., Ltd. Steam pipework.—Aiton & Co., Ltd. Two 5,000-kVA and one 6,000-kVA transformers.—Ferranti Ltd. H.p. switchgear.—British Thomson-Houston Co., Ltd.; Ferguson, Pailin, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; A. Reyrolle & Co., Ltd. Two water-tube boilers.—John Thompson Water-Tube Boilers, Ltd. Economisers.—E. Green & Son, Ltd. Valves and fittings.—Hopkinson's, Ltd. Feed regulators.—Copes Regulators, Ltd. Boiler soot blowers.—Ivon Blower Co. I.d. fans and grit collectors.—Geo. Howden & Co. Boiler meters.—Allen West & Co. Instruments.—Cambridge Instrument Co., Ltd. Coal weighers.—W. & T. Avery, Ltd.

Housing Committee. Accepted. Electrical installation at 250 houses on the Brownley Green Estate and sixty-two elsewhere.—H. C. Taylor & Co., Ltd.

Transport Committee. Recommended. Twelve months' supply of general stores. Switches, bell wire, &c.—L. Andrew & Co., Ltd. Bell switches.—General Electric Co., Ltd. Power and lighting cables and non-association cable for motor buses.—W. T. Glover & Co., Ltd. Cells for bell circuits.—Edison Swan Electric Co., Ltd. Switches.—Hart Manufacturing Co. Arc deflectors, electrodes and pinion wheels.—Metropolitan-Vickers Electrical Co., Ltd. Plug adaptors and brass armoured cable.—Ward & Goldstone, Ltd.

Middlesex.—Health Committee. Accepted. X-ray apparatus at Harefield sanatorium (£403).—Solus Electrical Co.

Highways Committee. Recommended. Automatic traffic signals, Barnet (£349), Harrow Road (£397), and Harlington (£350).—Automatic Electric Co., Ltd.

Sheffield.—Assistance Committee. Accepted. Electrification of lift at West Bar offices (£170).—Waygood Otis, Ltd.

Transport Committee. Accepted. Thirty tramcar trucks, without wheels and axles (£157 each).—Brush Electrical Engineering Co., Ltd. Thirty car sets of control and braking system (£182 per set).—Maley and Taunton, Ltd. Twenty traction resistances (£12 10s. each).—Metropolitan-Vickers Electrical Co., Ltd.

Staffordshire.—County Council. Accepted. Rewiring the County Buildings and police offices (£1,117).—W. Hampton. Rewiring the Judges' House and the Shirehall (£344).—W. J. France. Sound amplifying equipment at the Crown Court (£78).—British Thomson-Houston Co., Ltd.

Wimbledon.—Electricity Committee. Accepted. L.p. switchgear (£1,235).—George Ellison, Ltd. H.p. switchgear (£1,625).—Drake & Gorham, Ltd. Switchgear (£925).—A. Reyrolle & Co., Ltd. Kiosks (£240).—Foster Engineering Co. Switchgear for Raynes Park sub-station (£850).—Drake & Gorham, Ltd. Supply and laying mains from power station to sub-stations at Merton and Malden (£5,620).—Siemens Bros. & Co., Ltd.

Makers' Names Wanted

KABEX electric cooker.

Electrically heated pen for initialling hat bands.

House telephones marked VSA11412.

Forthcoming Events

Association of Mining Electrical Engineers.—(*West Wales Branch*).—Saturday, April 7th. Y.M.C.A., Swansea. Discussion on H.M. Electrical Inspector of Mines' Report for 1933. (*Kent Sub-Branch*).—Saturday, April 7th. Annual meeting and dinner. (*South Wales Branch*).—Saturday, April 14th. South Wales Institute of Engineers, Cardiff. 6 p.m. Discussion on H.M. Electrical Inspector of Mines' Report.

Association of Supervising Electrical Engineers.—Tuesday, April 10th. Lighting Service Bureau, W.C. 7.15 p.m. "Automatic and Remote Control Gear." Mr. H. Coates.

Illuminating Engineering Society.—Tuesday, April 10th. Institution of Mechanical Engineers, London. 7 p.m. "The Art and Practice of Garden Illumination." Mr. J. Eck.

Institution of Electrical Engineers.—Thursday, April 12th. Institution, London. 6 p.m. "The Application of a Gas-cooled Arc to Current Conversion, with special reference to the Marx-Type Rectifier." Dr. W. G. Thompson. (*London Students' Section*).—The meeting arranged for April 6th has been postponed. Tuesday, April 10th. 2 p.m. Visit to Messrs. C. H. Champion & Co., Ltd., Chadwell Heath. Saturday, April 14th. 2.30 p.m. Visit to Royal and Monument telephone exchanges. (*North-Eastern Students' Section*).—Friday, April 6th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Annual meeting and short paper night. (*South Midland Centre*).—Monday, April 9th. James Watt Memorial Institute, Birmingham. 7 p.m. Annual meeting. "Grid Metering." Mr. J. Henderson. (*Mersey and North Wales (Liverpool) Centre*).—Monday, April 9th. University, Liverpool. 7 p.m. Annual meeting. "The Super-Conductivity of Metals observed at Low Temperatures." Prof. J. C. M'Lennon. (*North-Western Centre*).—Tuesday, April 10th. Engineers' Club, Manchester. 7 p.m. Dr. W. G. Thompson's paper. (*Scottish Centre*).—Tuesday, April 10th. 39, Elmbank Crescent, Glasgow. 7.30 p.m. Annual meeting. "Research in the British Post Office." Mr. B. S. Cohen. (*North-Eastern Centre*).—Monday, April 9th. Armstrong College, Newcastle-on-Tyne. 7 p.m. Mr. Cohen's paper. (*Hampshire Sub-Centre*).—Wednesday, April 11th. Municipal College, Portsmouth. 7.30 p.m. "Broadcasting." Mr. N. Ashbridge. (*Wireless Section*).—Wednesday, April 11th. Institution, London. 6 p.m. "Principles of Audio-Frequency Wire Broadcasting." Mr. P. P. Eckersley. (*Irish Centre*).—Friday, April 13th. Gaiety Theatre, Dublin. 4 p.m. Faraday Lecture. "The Electrical Engineer and the Free Electron." Mr. C. C. Paterson. (*Meter and Instrument Section*).—Friday, April 13th. Institution, London. 7 p.m. "Experience with, and Problems Relating to, Bottom Bearings of Electricity Meters." Mr. G. F. Shotter.

Institution of Engineers-in-Charge.—Friday, April 13th. Annual dinner.

Notes

German Engineering

The current issue of the *Energiebibliographie*, published by the German National Committee of the World Power Conference, provides brief résumés of all the latest German publications of major importance throughout the entire field of power. It is divided into sections dealing with fuels, steam generation, electricity, water, intenal combustion and other engines, electricity distribution, gases, consumption and economics. The "fuels" section is divided into solids, liquids and gases; the "electricity" section is concerned mainly with station and machinery construction; while the "water" section describes recent publications dealing with hydro-electric development. The economic section is mainly descriptive, and deals, among other things, with costs, budgetary control, and tariffs for the supply of electrical energy. The Bibliography (5s. per annum) may be ordered through the Central Office of the World Power Conference, 63, Lincoln's Inn Fields, W.C.

Graphical Symbols for Telephony

The new British standard graphical symbols for telephony, telegraphy, and radio communication services are based on recommendations made by the International Electrotechnical Commission and by the International Consultative Committee on Long-distance Telephony. At the same time long-established practice in this country has been respected, with the result that the international recommendations have not been slavishly followed at the expense of involving revolutionary departures from the symbols to which British workers have become accustomed. The standard symbols have already been officially adopted by the Post Office and the B.B.C. Copies of this new British Standard (No. 530-1934) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Steel Rope Hardening

Dr. T. F. Wall, of the Department of Electrical Engineering Sheffield University, describes in *Nature* a method of measuring the time taken for a pulse of stress to travel along a steel wire, the rate of decay of the amplitude of the pulse in its passage to and fro being a measure of the damping. A purpose of the investigation was to ascertain whether the influence of work-hardening on the rate of decay provided a practical way of detecting its existence in wire ropes. One end of a bright drawn steel wire, ¼ in. in diameter and 459 ft. long, was placed in a d.c. solenoid near the centre of which was a search coil connected through a valve set to an oscillograph. The other end of the wire, which was clamped, was struck sharply and a pulse of stress travelled along the wire with the speed of sound. An e.m.f. was produced in the search coil by changes in stress due to the altered permeability, and was recorded by the oscillograph. The pulse of stress was reflected and travelled back to the clamped end, where it was again reflected and once more developed an e.m.f. in the search coil. The oscillogram showed three successive pulses in addition to the original pulse. The distance on the oscillogram between two records of e.m.f. gives the time taken for the pulse to travel twice the total length of the wire, and from it is derived the equation $C=5.04\times10^5$ cm. per sec., or, since $E=C^2p$, $E=29\times10^6$ lb. per sq. in.

Women Visit English Electric Works

Members of the Bradford branch of the Electric Association for Women visited the works of the English Electric Co., Ltd., at Thornbury, on March 28th, where they were conducted on a tour of all departments, but were particularly interested in the considerable range of domestic electrical appliances which are now produced at the Phœnix works, including cookers, water-heaters, fires, and refrigerator motors. The

Members of the Bradford Branch of the E.A.W. at the English Electric Co.'s Works

Lady Mayoress of Bradford (Mrs. A. W. Brown), former treasurer and now president of the branch, expressed the thanks of the visitors to the company and to the guides, and Mr. L. J. Sargent and Mr. W. A. Gillott spoke on behalf of the company. At the conclusion of the works inspection the visitors witnessed an electric cooking demonstration. A competition in placing different coloured radiators in order of popularity was arranged, the prize to be a radiator to be selected by the winner.

A 350,000-kW Station for South Africa

Many factors combine at the present time to increase the power requirements of the Witwatersrand industry. The abandonment of the gold standard with its concomitant increase in the price of gold have resulted in unprecedented expansion in the payable gold-bearing areas of the Rand. As a result several mines will be brought to the producing stage within the next few years. The importance of having adequate power available for these mines led to the decision of the Victoria Falls Power Co. to put in hand designs for further plant extensions —presumably at Vereeniging—which will increase that station to its maximum capacity of 140,000 kW.

The Electricity Supply Commission has now decided to erect an additional base load station of 350,000 kW on the Klip River, outside the village of Meyerton, in close proximity to Vereeniging. Plans for the new station are now in hand, and tenders will be invited in the near future. 106,000 kW of plant will be installed as a first instalment, and the station should be in commission within two years. Although the Electricity Control Board has decided to place the ownership of the new station in the hands of the Commission, the undertaking will be operated by the Victoria Falls Power Co., thus following the precedent set in 1924, when the construction of Witbank station was undertaken. It had been generally anticipated that the V.F.P. Co. would own Witbank, but the Electricity Supply Commission intervened. Ultimately a compromise was reached, ownership of the station being entrusted to the Commission and the running being left in the hands of the company. All surplus power produced after the Commission had supplied the needs of the surrounding area was and is taken by the V.F.P. at a fixed rate. The system has been found mutually satisfactory, and there is no reason why joint working should not be equally satisfactory for Klip River.

Appointments Vacant

Two sales service engineers for Fulham Electricity Department.

Assistant development engineers for Brighton Electricity Department.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. G. R. J. Parkinson, manager and engineer of the Midland Electric Corporation for Power Distribution, Ltd., is retiring shortly from his present position. At the annual meeting of the company, held on March 27th, Mr. G. H. Nisbett, the chairman, stated that it was proposed to elect him to a seat on the board, enabling existing co-operation to continue. Mr. Parkinson had agreed to undertake special duties in the company's area of supply at the request of the board. Mr. Parkinson received his early training at the works of Messrs. John Fowler, Leeds, and with the London Electric Supply Corporation, Deptford. For five years he was engineer-in-charge at the Portsmouth undertaking, and subsequently went to the South London Electric Supply Corporation, as station superintendent. He joined his present company thirty-seven years ago as resident engineer, and after ten years' service became chief engineer. He held that position for twelve years, when he was appointed to his present post. He was chairman of the South Midland Centre of the Institution of Electrical Engineers in 1929-30.

[Elliott & Fry
Mr. G. R. J. Parkinson, M.I.E.E.

Mr. J. F. Irvine, of Messrs. J. F. Irvine, Ltd., Dundee, has been elected president of the Electrical Wholesalers' Federation of Great Britain. Mr. Irvine, who is a native of Shetland, was educated at Edinburgh, and received his electrical training at the Heriot-Watt College in that city. He spent a few years with Messrs. Bruce, Peebles & Co., Ltd., afterwards joining the Dundee depôt of the Edison Swan Electric Co., Ltd., where he was manager for many years. He founded J. F. Irvine & Co., Ltd., in 1919, and established business connections throughout North and Mid-Scotland. Mr. Irvine, who is well known to the trade generally, has for several years been representative of the Scottish Section on the Council of the Electrical Wholesalers' Federation.

Mr. J. F. Irvine

Mr. F. S. G. Hinings, M.I.E.E., is severing his connection with the British Electric Transformer Co., Ltd., which he has represented in the North of England and Scotland during the last twenty years. Mr. Hinings previously held appointments with the Leeds and Birmingham electricity undertakings. He is a past-chairman of the North Midland Centre of the I.E.E.

Mr. W. J. H. Penman, transport manager to Perth Corporation, has been appointed transport manager to Lancaster Corporation at a salary of £500 per annum, rising to £600.

The Blackburn Corporation General Purposes Committee has approved a recommendation that the salary of **Mr. W. A. Royle,** the borough electrical engineer, be increased from £1,000 to £1,200 per annum.

Mr. E. J. McWilliams, A.M.I.E.E., has been appointed electrical engineer in the Architects' Department of the Middlesex County Council. Mr. McWilliams served his apprenticeship with Messrs. Scott & Mountain, Ltd., of Newcastle-on-Tyne, and in 1907 was appointed assistant engineer in the Consumers' Department of the Cleveland & Durham Power Co., Ltd. In 1909 he joined the Telephone Department of the General Electric Co., Manchester, but later in the same year went to Johannesburg, where he was engaged on constructional work during the general electrification of the Rand mines. He joined the Distribution Department of the Victoria Falls & Transvaal Power Co., Ltd., in 1911 as engineer, supervising a section of the company's system, and in 1914 he became assistant electrical engineer, supervising the operation of the hydro-electric power plant of the St. John del Rey Mining Co., Brazil. He returned to England in 1915 to join H.M. Forces. From 1924 to 1930 he was with Messrs. Merz & McLellan, and during the last four years with that firm was occupied with work for and advice to the Capetown and Durban municipal undertakings. He joined the Ford Motor Co. in February, 1931, as chief electrical engineer responsible to the power and construction engineer, and devised all the schemes for the electrical equipment in the Dagenham works and the electrical side of the Ford Company's large power station.

[Elliott & Fry
Mr. E. J. McWilliams

Obituary

Mr. J. A. Lloyd.—The death has occurred of Mr. John Ambrose Lloyd, who was a member of the staff at Rhostyllen, of the North Wales Power Co. He was forty-two years of age.

Mr. J. W. Forbes.—The death is announced, at the age of seventy-eight, of Mr. John William Forbes, of the Manor House, North Rode, Macclesfield, who was a director of Messrs. Drake & Gorham, Ltd.

Mr. N. W. Sibley.—The death occurred on March 23rd, from pneumonia, of Mr. Norman W. Sibley, of the Manchester office of Messrs. Allen West & Co., Ltd. The interment took place on March 27th at the Extra-Mural Cemetery, Brighton.

Domestic Electrical Appliances in South Africa.

From our JOHANNESBURG CORRESPONDENT

A GREAT deal has been written in the ELECTRICAL REVIEW from time to time showing the excellent prospects which exist for domestic electrical appliances in South Africa. Development in this respect has been widespread indeed, and figures available in respect of the domestic appliances installed in a representative number of towns show how rapidly the "electric home" idea is now taking shape.

In South Africa the greatest field for electrical expansion is provided in the domestic direction, and electrical engineers have not been slow in developing this load. Where the generating station is in a position to meet any considerable increase in load, suitable tariffs, coupled with assisted purchase of appliances, have produced outstanding results, to which the figures that follow will testify. It should be carefully noted, however, that the data given in this review relative to the appliances installed is necessarily incomplete, as some undertakings keep a record only of such major appliances as cookers and water heaters. Thus, there must be hundreds of radiators, refrigerators, and other appliances in use in the majority of towns of which the supply authority has no direct record or knowledge, and which collectively constitute a large proportion of the domestic power load.

Progress in Capetown and Durban

Capetown, at the moment, furnishes a good example of judicious electrical development. In this progressive centre, under the able guidance of Mr. G. W. Swingler, M.I.E.E., the deferred-payment scheme has recently come to the end of the third year of its existence, and the results achieved over the three years have been really remarkable, as will be seen from the following figures, which show the progress from September 1st, 1930, to November 30th, 1933: Number of cookers installed, 6,381; refrigerators, 651; water heaters, 238. Other appliances: Washers, 114; other major appliances, 19;

minor appliances, *e.g.*, kettles, irons, percolators, &c., 710. Total, 843.

The total connected load of these appliances is 44,204 kW, and their retail value amounts to £230,128. It may be mentioned also that cookers are being installed in this city at the rate of over 200 per month. Prior to the introduction of the deferred-payment scheme there were, so far as could be ascertained, only 1,050 ranges in use in Capetown.

Durban also shows an extraordinarily satisfactory position. The number of cookers as at November 30th, 1933, was no fewer than 11,262. At the same date there were 3,526 refrigerators, and 6,393 water heaters. The following amounts have been advanced to purchasers of electrical appliances: Stoves and water heaters, including wiring, from April, 1925, to October 31st, 1933, £193,474; refrigerators, from November, 1931, to November 30th, 1933, £50,130. Total, £243,604. The domestic power load (peak) is shown at 24,071 kW.

The Johannesburg Cooking Load

In Johannesburg good progress continues to be made, as the following data shows: Number of cookers installed, 4,357 (only cookers consuming 10 A and over included); water heaters, 141 (Hocking type heaters not included); domestic power load (stoves and water heaters only), 29,860 kW; number of loans passed: 1,755; amount lent on deferred-payment scheme, £66,675 (August 1st, 1930, to November 30th, 1933—appliances only). Pretoria also is making headway; 2,048 cookers and 422 water heaters have been installed, and £35,618 has been spent on domestic appliances under assisted-purchase schemes to date.

East London and Cambridge show steady progress in respect of domestic electrification, the number of cookers installed up to November 30th, 1933, being 1,030 (East London, 834; Cambridge, 196); the number of water heaters, 333 (East London, 307; Cambridge, 26); and the amount spent on domestic appliances under the assisted-purchase scheme (East London only), £6,609. As at November 30th last year, Port Elizabeth had 1,365 cookers, 250 refrigerators, and 418 water heaters on its mains. An assisted-purchase scheme was officially inaugurated on December 13th last, and there is every reason to expect a rapid increase in the future in the number of domestic electrical appliances. Bloemfontein is showing satisfactory expansion in the field of domestic electrification, as will be seen from the following figures, which are the latest available: Cookers, 600; radiators, 3,000 (approx.); refrigerators, 80 (approx.); water heaters, 133; fans, 4,000 (approx.); amount spent on domestic appliances under hire-purchase scheme, £3,100.

The following approximate figures show the position in Kimberley, where no assisted-purchase scheme is in operation: Cookers, 140; radiators, 2,500; refrigerators, 350; water heaters, 35; other appliances, presuming this to include kettles, irons, vacuum cleaners, hot plates, toasters, &c., between 7,000 and 8,000. The gradual expansion of Benoni will be seen from the following: Cookers, 232; refrigerators, 110; and water heaters, 20. Springs is making good progress in fostering domestic electricity, and has connected 202 cookers, 10 refrigerators, and 18 water heaters; the domestic power load is 650 kW, and the amount spent under the assisted-purchase scheme, £4,080.

The city of Pietermaritzburg is also making satisfactory progress in the sphere of domestic electrification, and the following figures reflect the position to date: Cookers, 1,374; refrigerators, 450; and water heaters, 362. The amount spent on domestic appliances under assisted-purchase schemes is £39,800.

The above review, which is not in any way exhaustive, provides some sort of guide to the general state of domestic electrification. It must be remembered that the "all-electric" home is a comparatively recent innovation in this country, previous to which lighting only reigned supreme in the average household. To-day, of course, the economies of electricity in the house are better appreciated, with the result that appliances of all sorts are in constant demand. During the next twelve months a material forward move can be expected, and British manufacturers should keep their eyes upon the market.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Radion, Ltd.—Private company. Registered March 28th. Capital, £6,000 in 4,750 shares of £1 each and 25,000 shares of 1s. each. Objects: To adopt an agreement with J. Fodor and S. P. Rety, and to carry on the business of an electric light company in all its branches. The directors are: E. L. Joseph, 73, Oxford Gardens, W.10 (director of Ozonair, Ltd.), A. W. Beuttell, 126, Streatham Hill, S.W.2 (director of Linolite, Ltd., and Ozonair, Ltd.), H. Keasley, 34, Keswick Road, Putney, S.W.15, and S. P. Rety, 84, Castellian Mansions, W.9. Secretary: L. A. Fickling, 96, Victoria Street, S.W.1. Registered office: 96, Victoria Street, S.W.1.

Burns & Dudgon, Ltd.—Private company. Registered March 28th. Capital, £2,500 in £1 shares. Objects: To acquire the business of electrical engineers, carried on by Burns & Dudgon at John Street, Wolverhampton. The directors are: A. D. Burns, "Moglena," Trysull Road, Merry Hill, Wolverhampton, and E. N. Dudgon, "Montcalm," Trysull Road, Merry Hill, Wolverhampton. Secretary: W. H. Bishop.

Camel Accumulators, Ltd.—Private company. Registered March 24th. Capital, £300 in £1 shares. Objects: To acquire the business of manufacturers, sellers and hirers of accumulators, batteries, electrical and wireless appliances carried on by Maurice and Elizabeth Marks, at 9, Newington Causeway, S.E.1. The first directors are: M. Marks and Elizabeth Marks, both of 9, Newington Causeway, S.E.1. Secretary: Gertrude Puleston. Registered office: 9, Newington Causeway, S.E.1.

Southall Valve Works, Ltd.—Private company. Registered March 26th. Capital, £2,500 in 2,000 "A" shares of £1 and 2,000 "B" shares of 5s. each. Objects: To carry on the business of radio, motor, electrical and mechanical engineers, &c. The subscribers are: G. H. J. Clark, Bachelor's Club, 8, South Audley Street, W.1, and two others. Registered office: 135/137, Queen Victoria Street, E.C.4.

Electric Tubular Heating Co., Ltd.—Private company. Registered March 26th. Capital, £1,050 in 1,000 redeemable 7 per cent. cumulative preference shares of £1 each and 1,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of, agents for, and dealers in electric heating apparatus, electrical goods, equipment, and accessories of all kinds, &c. The subscribers are: F. Wasserman, 27, Melrose Avenue, N.W.2; and R. Roth, 39, The Vale, Golders Green, N.W.11. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, W.C.2.

Permaheat Safety Cushion Co., Ltd.—Private company. Registered March 24th. Capital, £7,500 in 1s. shares. Objects: To carry on the business of manufacturers of and dealers in electrical cushions, blankets, lamps, stoves, cookers, dynamos, motors and electrical plant generally, &c. The first directors are: R. Calderbank, Welch Whittle, near Chorley, Lancs; H. Davenport, 17, Strathmore Court, St. John's Wood, N.W.8; and H. A. Moore, 111, Fox Lane, Palmers Green, N.13. Registered office: Aldwych House, Aldwych, W.C.2.

Returns of Electrical Companies

Dowling & Sons, Ltd.—Particulars filed of £500 debentures, authorised March 14th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £150.

Challis Transformers, Ltd.—Debenture dated March 10th, 1934, to secure all moneys not exceeding £200, for which the debenture holder (J. C. J. Smith, 55, Earlsdon Avenue, Coventry) may become liable under a guarantee to the company's bankers. Property charged: The company's real and personal property and assets, present and future, including uncalled capital.

Arthur for Wireless, Ltd.—B. S. Lane, 119, Bishopgate, E.C.2, was appointed receiver and manager on March 14th, 1934, under powers contained in debentures dated September 8th, 1933.

Sign Construction Co., Ltd.—(A) Further charge on benefit of a certain agreement relating to the construction and maintenance of luminous neon tube electric signs and all moneys due or payable by way of rent thereunder, dated March 6th, 1934, to secure £500. Holders: United Kingdom Advertising Co., Ltd., 25, Shaftesbury Avenue, W.1. (B) Charge dated March 6th, 1934 (supplemental to three mortgages dated July 27th, 1933, November 15th, 1933, and March 6th, 1934), and by way of collateral security for a total sum of £3,781 13s. 4d. owing thereunder. Property charged: Benefit of certain contracts. Holders: United Kingdom Advertising Co., Ltd.

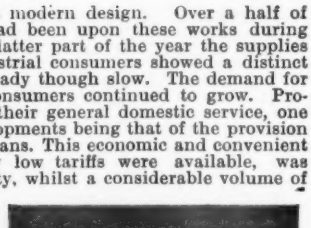
Goole Radio Relay Service, Ltd.—The nominal capital has been increased by the addition of £1,000 beyond the registered capital of £1,000. The additional capital is divided into 1,000 6 per cent. redeemable preference shares of £1.

Harvey-Thompson Accumulator Service, Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 shares beyond the registered capital of £4,000.

City Notes

The Shropshire, Worcestershire & Staffordshire Electric Power Co. held its annual meeting on March 28th. Sir Holberry Mensforth (chairman), who presided, in presenting the report and accounts (Electrical Review, March 16th, p. 398), said that towards the end of the year a Special Order was granted increasing the company's nominal capital by £1,000,000 to £5,500,000 and the authorised borrowing powers by a like amount to £4,125,000. A feature of their properties was that the power plants and the transmission system and distribution

networks, were of the most modern design. Over a half of their capital expenditure had been upon these works during the last five years. In the latter part of the year the supplies of electricity taken by industrial consumers showed a distinct improvement, which was steady though slow. The demand for electricity from domestic consumers continued to grow. Progress had been made with their general domestic service, one of the most important developments being that of the provision of hot water by electrical means. This economic and convenient service, for which specially low tariffs were available, was rapidly growing in popularity, whilst a considerable volume of new business in the older established services, such as cooking, heating, and the more scientific use of electric lighting, had been obtained. Compared with the previous year there had been an increase of approximately 20 per cent. in the number of consumers, whilst the sales of electricity for all purposes by the company and its subsidiaries (excluding the South Wales Power Co.) had increased by about 14 per cent. They now had in operation a network of approximately 1,800 miles of transmission and distribution mains, well placed to deal adequately with the needs of their area of 3,500 sq. miles. The number of distributing stations from which low-pressure supplies were available now exceeded 470. In the outlying sections of their area they had continued the development of the electrification of rural industries, including several branches of agriculture and farming and to afford supplies to local government authorities for water pumping and sewerage schemes. Progress had also been made in the extension of street lighting by electricity; this system had been adopted in the rural areas by no fewer than thirty parishes. During the year their "selected" station at Stourport had been connected to the grid and for a considerable time now Stourport had been working in conjunction with this system. The Central Electricity Board was to commence trading in the Central England area on April 1st, and it was understood that their power station would then be taking its appropriate part in the national scheme. Their largest subsidiary, the South Wales Company, had made good progress during the year, and its results reflected, in some measure, the slight improvement which took place during the latter part of the year in general business. Their policy was to provide large industrial undertakings with electricity at as low a price as was practicable, as it was felt that cheap power had a great influence upon unemployment, and that low power charges were at least of equal importance to the community at large as a very low rate for lighting and domestic purposes.



[Lafayette
Sir Holberry Mensforth, K.C.B.

The Mersey Power Co., Ltd.—Presiding at the annual meeting held on March 27th, Mr. H. J. Falk (chairman) said that the general depression in all industries continued into last year, but in the summer growing improvement became visible in some sections of trade. Thus by December 31st last their sales rose to 75,000,000 kWh, as compared with 52,000,000 kWh in 1932. The increase was widely spread in their whole area of 100 sq. miles, and not the least remarkable feature was the rapid growth of domestic consumption. Referring to the general increase in the figures for consumption, Mr. Falk said that four large consumers expanded more than 10 per cent., and one of the bulk supplies was 15 per cent. greater and was still growing. Another considerable demand was caused by the prolonged drought. The total number of consumers rose from 11,136 in 1932 to 13,249 in 1933. The two-part tariff and assisted wiring had provided large additions—nearly 50 per cent. Most notable was the growth of more than 100 per cent. in electric cookers. Ten new sub-stations had been built, making a total of 116, and their cables had been extended by thirty-five miles to 383 miles.

The South London Electric Supply Corporation, Ltd., held its annual meeting on March 27th. Sir Robert Renwick, who presided in the absence of Lord Gainford, read the chairman's speech, in the course of which he said that during the latter part of last year there was a distinct improvement in their output for industrial purposes. Their area was in the main an industrial area, and in consequence they would derive the benefit of the much-needed improvement in industry. There was also a certain amount of new building and rebuilding going on in the area, and already they had obtained business from this source. The current year had started well, and for the first two months they were able to show an increase of over 14 per cent. in their output as compared with the corresponding period of 1933. During the latter part of last year the company inaugurated schemes for the hiring of cookers and water heaters, and these schemes were making rapid progress.

The Richmond (Surrey) Electric Light & Power Co., Ltd.—Presiding at the annual meeting on March 27th, Sir Robert Renwick (chairman) said that in spite of the mild weather experienced last year the sales of electricity amounted to 6,242,661 kWh, as compared with 5,300,288 kWh for the previous year. They had made considerable reductions in the charges for supply. Although the reduction in the flat rate for lighting was made in pursuance of an agreement with the Corporation, it was felt that a reduction in the running charge under the "all-in" tariffs would tend to encourage the greater use of electricity for all purposes. The further reduction was therefore made. Their distribution system had been so reorganised that they were in the position of being able to treble their output without similarly affecting their capital expenditure. A scheme for the hiring of cookers and water-heaters was inaugurated about six months ago, and they had already hired out many hundreds of cookers and water heaters, about 90 per cent. of the former displacing gas cookers. To date the sales of electricity had increased by over 25 per cent. as compared with the corresponding period of last year.

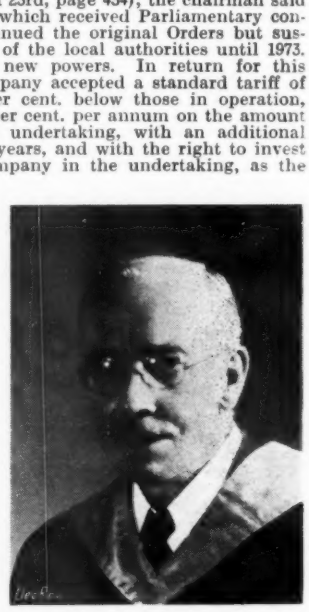
The British Aluminium Co., Ltd.—Presiding at the annual meeting on March 27th, Mr. R. W. Cooper (chairman), in the course of his speech, said constructional works on the second stage of the hydraulic portion of the Lochaber hydro-electric development, which was being carried out for their subsidiary, the North British Aluminium Co., Ltd., made steady progress throughout the year. The three-mile tunnel to connect the waters of Loch Laggan with those of Loch Treig had been completed, and the dams for the Laggan and Treig reservoirs were now practically ready. Beyond some finishing work little now remained to be done before the additional water supply was available.

The Bath Electric Tramways, Ltd.—Presiding at the annual meeting on March 27th, Mr. E. H. R. Trenow (chairman and managing director) said that the gross receipts of tramway undertakings in Great Britain showed a falling-off last year of 6½ per cent., but the company's receipts did not suffer in like proportion, the decrease being only £571, or under one per cent. The net revenue was £21 better than in the preceding year. Economies had been effected without any curtailment of work necessary to keep the whole of the system in an efficient operating condition. The few weeks of the current year showed small improvements in passengers carried, in traffic receipts, and in net revenue.

The River Plate Electricity Co., Ltd., reports that the revenue for 1933 includes a full year of the portion of annuity payable by the Cia Hispano-Americana de Electricidad attributable to interest, namely, £28,581, before providing for the tax. Interest and dividends on invested funds of the company amounted to £39,027. After meeting income tax and administration expenses the net revenue was £46,379 (against £49,248), plus £10,163 brought in. The ordinary dividend is unchanged at 10 per cent. and £14,167 is carried forward.

Cammell Laird & Co., Ltd., report a net profit for 1933 of £31,876, as against £623 in the previous year. Interest at the rate of 2½ per cent. on the 5½ per cent. first and third debenture stocks will be paid on May 1st, the carry-forward being raised from £741 to £3,005. The second debenture stock was redeemed during the year.

The Midland Electric Corporation for Power Distribution, Ltd., held its annual meeting on March 27th, Mr. G. H. Nisbett (chairman) presiding. In presenting the report and accounts (Electrical Review, March 23rd, page 434), the chairman said that the new Special Order, which received Parliamentary confirmation in July last, continued the original Orders but suspended the purchase rights of the local authorities until 1973. It also gave the company new powers. In return for this extension of tenure the company accepted a standard tariff of charges to the public 10 per cent. below those in operation, and a standard profit of 6½ per cent. per annum on the amount determined as used in the undertaking, with an additional ½ per cent. for the first ten years, and with the right to invest the free reserves of the company in the undertaking, as the need arose, at a rate of 6 per cent. For every 2½ per cent. reduction from the standard tariff in force for a complete year the company could retain an additional quarter per cent. profit above the rates previously quoted. During the year £93,251 was expended on extensions to meet the increased demand from existing and new consumers. In comparing the revenue account with those of previous years it had to be borne in mind that the directors made a voluntary reduction of 10 per cent. on all rates during 1932 at the request of the local authorities who were willing to complete negotiations, but were unable to do so due to the delay on the part of one or two authorities. As from January 1st, 1933, the standard tariff became legally operative, and they made a further reduction of 10 per cent. in anticipation of increased profits from improving output. In May last year a decided increase in the industrial demand was noted, and this improved from month to month until, at December last, the output was 28 per cent. greater than in the corresponding month of the previous year, and this proportionate increase had been maintained. As from January 1st last the charges for electricity were approximately 25 per cent. below those in operation when the negotiations for the new Order commenced and 15 per cent. below the standard tariff. The domestic load continued to grow, 3,371 new consumers being connected to the mains last year. The facilities offered for the hire purchase of wiring and apparatus had assisted in the expansion of the revenue. Up to date over £50,000 had been expended in this manner, and there was no slackening in the demand.



Mr. G. H. Nisbett, M.Eng., J.P.

Electrical and Musical Industries, Ltd.—At an extraordinary meeting held on March 28th the scheme for the reduction of the capital of the company was approved. Mr. A. Clark (chairman) stated that the progress of the company reported at the annual meeting in November continued. On January 15th all arrears of preference dividend were paid, and the operating

companies continued to work at a profit. Referring to the registration of a subsidiary company, H.M.V. Household Appliances, Ltd., he said that the increasing employment of electricity in this country augured well for the sale of articles of this nature, and their manufacturing and research facilities were readily adaptable to this particular type of goods. The directors did not expect immediate profits from this new undertaking.

The Torquay Tramways Co. reports a net profit for 1933 of £23,131, as against £15,579 in the preceding year, which with £2,973 brought in makes £26,104. Shareholders have approved of negotiations whereby the company disposed of its transport undertaking to the Devon General Omnibus and Touring Co. At the present time the company has about £200,000 in hand, and it is estimated that after realising remaining assets, discharging liabilities and providing for the cost of liquidation, there should be a balance of some £185,000 to £190,000 available for distribution to shareholders, in addition to ordinary shares of the Devon General Co. (or cash in lieu thereof) under the scheme. An extraordinary meeting is to be held at the conclusion of the annual meeting on April 19th for the purpose of passing the necessary resolution to put the company into voluntary liquidation.

A. Reyrolle & Co., Ltd., report a profit for the year ended December 31st last of £98,644, as compared with £104,285 in 1932. To this is added £96,511 brought in less £1,000 distributed to local charitable and other funds, making £194,155. The ordinary dividend is maintained at 12½ per cent., and £113,855 is carried forward. The report states that orders received for the company's manufactures, including those obtained by Messrs. J. H. Holmes & Co., Ltd., were higher than in the previous year. Sales in 1933 were, however, lower than in 1932, and there was a reduction in the amount of uncompleted work in hand at the end of the year. During the current year the company has subscribed £260,000 of capital in the Parolle Electrical Plant Co., Ltd., which has purchased from the executors of the late Sir Charles Parsons shares held by him in C. A. Parsons & Co., Ltd.

The Telegraph Construction & Maintenance Co., Ltd., reports a net loss for 1933 of £24,595, after the transfer from the Gutta Percha reserve of £12,000 no longer required, which compares with a net profit of £13,230 for 1932. The balance brought in is £63,451, and after deducting from this the loss for the year, £38,856 is carried forward. The report states that concentration of the company's activities at Greenwich has been completed, the Wharf Road factory has been vacated and about one-half of these premises has been sold. Further reductions have been made in the standing charges. Orders for submarine cable have been scarce, and competition has caused prices to be somewhat low. The works at Greenwich have been extended to provide for the production of l.p., h.p., and "super-tension" cable for lighting and power purposes. Meeting: April 12th.

The Notting Hill Electric Lighting Co., Ltd., reports a profit for 1933, including £21,298 brought in, of £87,831, as against £80,646 in 1933. After deducting debenture interest, &c., it is proposed to pay an extra dividend for 1932 on the ordinary shares at 2 per cent., less tax, and to pay a final ordinary dividend of 7.0646 per cent., making 11.0646 per cent. for the year, and to carry forward £19,670. During the year a further £1,600 of 5 per cent. debenture stock was redeemed, and the balance outstanding is now £145,450. The sales of electricity totalled 13,222,278 kWh, as compared with 12,337,395 kWh in 1932, the number of consumers increased from 13,051 to 14,033, and the kW connected from 23,057 to 24,998. Meeting: April 13th.

The Woking Electric Supply Co., Ltd., reports a balance on the year's working for 1933 of £59,456, to which is added interest and a balance brought in of £1,329, making £63,584. Depreciation and renewals fund receives £23,000, and it is proposed to pay an ordinary dividend of 10 per cent. The balance carried forward is £1,638. The sales of electricity totalled 9,826,308 kWh, as compared with 8,648,439 kWh in 1932, and the number of consumers increased from 9,026 to 10,505.

The Marconi International Marine Communication Co., Ltd., reports a profit for 1933 of £104,222, as compared with £168,693 in the preceding year, to which is added £33,045 brought in, making £137,267 available. The final dividend is 5 per cent., maintaining the distribution for the year at 7½ per cent.; £11,000 is placed to income-tax reserve and £25,000 to general reserve, leaving £11,813 to be carried forward. Meeting: April 12th.

The Gateshead and District Tramways Co. reports a net profit for 1933 of £22,787, as compared with £22,088; to this is added £23,467 brought forward, making £46,254. The ordinary dividend is 6 per cent. and £23,813 is carried forward.

The Windermere & District Electricity Supply Co., Ltd., reports a balance on revenue account of £9,449. The final ordinary dividend is 6 per cent., making 10 per cent. for the year, and £3,450 is carried forward.

The Keswick Electric Light Co., Ltd., reports a net revenue, including an amount brought in, of £4,255. The ordinary dividend for the year is 10 per cent., and £615 is carried forward.

The Telegraph Condenser Co., Ltd., proposes to pay an ordinary dividend for the half-year to December 31st last at the rate of 10 per cent. per annum.

The Jarrow and District Electric Traction Co., Ltd., reports a surplus for 1933 of £112, from which is deducted the loss of £106 brought in, leaving a balance of £6 to be carried forward.

Edgar Allen & Co., Ltd., have decided to defer payment of the preference dividend as it is still necessary to conserve the company's resources. This dividend is in arrear from April, 1931.

The Canadian Westinghouse Co.—According to the Toronto correspondent of the *Financial Times*, the net profit for 1933 was $469,963, after providing for depreciation, taxes and other charges. This compares with $706,330 in 1932.

The British Thomson-Houston Co., Ltd., reports a profit for 1933 of £256,949, as compared with £392,015 in the preceding year; to this is added £227,795 brought in, less interest on debentures and loans (£83,665), making £401,079. It is proposed to appropriate for depreciation and other writing-off £92,886, and to pay preference dividends requiring £78,749. The directors are unable to recommend a dividend on the ordinary shares, and £229,443 is carried forward. For the previous year 4 per cent. was paid on the ordinary capital. The report states that the effect of the industrial depression of the past two years, particularly in the heavy engineering products which the company manufactures, was felt more fully in 1933 than in the previous year, and the output of the factories was considerably below normal. There was, however, a noticeable improvement in trade during the latter part of the year and, in consequence, the orders received for the year showed an increase over those for 1932. An agreement was made with the holders of the 6 per cent. debenture stock whereby the rate of interest was reduced from 6 per cent. to 5 per cent. as from January 1st, 1933. Redemption has been duly effected of the amount of 4½ per cent. and 5 per cent. debenture stock required in the respective trust deeds. Meeting: April 11th.

This is the "nerve centre" of the new Mersey Tunnel, from which the traffic is controlled

The Salisbury Electric Light & Supply Co., Ltd., reports a profit for 1933, after deducting debenture interest, &c., and including the amount brought in, of £15,521. It is proposed to pay a final dividend of 6 per cent., making 10 per cent. for the year and £541 is carried forward.

Stocks and Shares

Tuesday Evening.

MOST of the responsible opinion recently voiced in connection with our national trade and industry has contained a note of warning against over-optimism in respect of conditions as these obtain to-day. Wholehearted and widely spread testimony to the revival in business is given by many indisputable pointers. Easter this time has been spent with a feeling of relief and thankfulness at the depression of past years having rolled away. More employment is on every hand apparent. Home industries have awakened. But, in a vast clearing house for trade such as this country is, the necessity for foreign markets must be always present, and the chairman of Vickers, at last week's meeting of proprietors, declared that real prosperity in this country cannot proceed beyond a certain point until a feeling of international confidence is restored. The new British Government issue seems likely to achieve a public success.

The Investor's Dilemma

The setting forth of this present-day situation will savour, no doubt, of homiletic prosiness, yet pardon may be prayed for its prolixity on the ground that its proper understanding is of no little importance to everyone connected with financial affairs. And few people, indeed, escape inclusion in such a category. The prices of Central Electricity and other such authorities' securities are governed by the factors just considered. Quotations of shares in the market for electrical manufacturing and equipment companies are dependent, either more or less, upon the volume of external as well as internal trade. In the former group, the high levels reached by gilt-edged securities are due to the circumscribed area in which capital demanding employment is compelled to move by reason of industry's inability to use the money to advantage.

The only movement in our prices in this group is a gain of 1½ points in the speculative "C" stock of the London Passenger Transport Board.

Electricity Supply Shares

Very fortunately, the Home electricity supply companies are free, in an almost unique degree, from the need to look abroad for contributions to their profits. Indirectly they are affected, of course, through the demands made upon them by customers whose activities are influenced by export trade. But there is so considerable a scope for talent—to borrow a Stock Exchange phrase—within these shares that the revenue accounts can go from strength to strength on the business internally handled. Every chairman at the recent companies' meetings has been able to congratulate his fellow-shareholders upon better results, expanding activities, promising prospects. Our share-lists emphasise, in tangible manner, the same story, and every broker in the Stock Exchange confesses his difficulty in finding electricity shares which he can place before clients who clamour for investments as sound as these are, and which—here's the rub—give a reasonable return upon the

money which clients want to spend in the securities. West Gloucestershire ordinary stock is a feature of strength in the provincial list, with a rise of 5, to 80.

"Shares on Offer"

With a view to being of practical service in this latter field, mention is made here from time to time of what stocks and shares are actually obtainable in the Stock Exchange market. Personal experience knows only too well how exasperating it is for a client to find that there is none to be obtained of some security which a Press recommendation has praised as being very desirable for investment. The advice is frequently sound and worth following, yet its value becomes no more than a cause of aggravation unless care has been taken to ascertain beforehand whether the shares are available for prospective purchasers. If they are not, it is the Stock Exchange broker whom the client is apt to regard as a fool when the client's order to buy is returned with the intimation that there is none of these shares in the market. They may come in, of course, through deceased accounts, or other sellers, but the investor is not always in a mood to wait for an indefinite period. He, naturally, wants his money to be earning something, and as soon as possible.

The Buyer's Guide

In a market so closely the preserve of the investor as is that for electricity supply issues, this trouble of securing stock and shares is peculiarly present. Thus it is that the practical mind is concerned with knowing, and indicating, what is on offer in the Stock Exchange market at the time. The client can go to the Stock Exchange broker, who, in his turn, knows the market where the securities are negotiated, and, in the majority of cases, the purchase will be made at prices probably a trifle lower than those given here. By way of a hedge, may it be observed that as this article is written on Tuesday evening, and the Electrical Review is published later in the week, there is always the chance that what was obtainable on Tuesday may have been taken before the succeeding Friday. But that is a business risk which cannot be guarded against.

Manufacturing and Equipment Shares

The dullish disposition noticed here last week in the market for shares in the manufacturing group still persists. Sir Alexander Roger, at the meeting of British Insulated Cables, regretted the tendency of our Government to usurp the functions of an agent in the matter of making bargains for business concerns. He maintained that increased co-operation in each industry will prove the best stimulus for revival in international trade. The British Insulated Cables had received more orders, but at a lower average of value, in the year he was reviewing. This is doubtless the case with many other industrial companies. So far as price-fluctuations go, the changes this week are of little consequence. Callenders are slightly easier at 57s. 6d., and Siemens at 18s. 9d. Johnson & Phillips hardened to £1. Associated Electrical Industries, after their fall on the reduction in dividend, regained a few pence, to 16s. 3d. Philips' Incandescent Lamps are 6d. down at 46s. 9d. Electric & Musical Industries, or, colloquially, "Emmies," are a little better at 25s. 9d. The scheme for writing off half the nominal value of the ordinary shares was carried without dissent at last week's meeting. A line of electric household refrigerators is to be the first of the articles placed before the public by the H.M.V. Household Appliances, Ltd., the new subsidiary of the Electric & Musical Industries Company. Arons are 53s. 6d., after being 54s. Reyrolles are 1s. better at 53s.

The Buyer's Guide

Mr. J. H. Thomas assured the House of Commons that there is no ground for anxiety as to the City of Montreal's capacity for meeting its engagements. This specific contradiction to alarmist reports, the object of whose dissemination has yet to appear, served to correct any apprehension that might have been felt concerning the stability of the City. Montreal Light & Power shares, which had suffered very lightly, are 37¾, Power Corporation of Canada 12½, Shawinigan 21½. Brazilian utilities are attracting spasmodic speculation. San Paulo Electric 5 per cent. first mortgage bonds are firmer at 73½. On the other hand, Brazilian Traction common shares have gone back to 10¾. Amongst other foreign issues, Tokyo Electric 6 per cent. sterling bonds are firmer at 80. The annual accounts, awaited with a good deal of interest in this country, are expected to arrive by mail in the near future.

Cables and Wireless

Cables and Wireless stocks are still on the heavy side. The Anglo-Portuguese meeting evoked the interesting statement that the company had spent three-quarters of a million pounds within the past six years in the provision of the most modern and up-to-date plant. The ordinary shares are quoted at 28s. 3d., and the new shares, with 11s. paid, at 4s. premium. Marconi Marines went farther ahead, to 32s., thanks to the satisfaction felt at the maintenance of the 7½ per cent. dividend. The working profits are about the same as those of a year ago. Telephone Manufacturing are better at 3s. 7½d. Rentals remain at 7s. 6d. Several thousands of Telephone & General Trust 7 per cent. preference have recently changed hands on the basis of 27s. 9d. American Telephone & Telegraphs at 115½, and Internationals at 14 have hardly moved.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Apl. 3.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	78/9	—	3 16 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/6	—	3 19 0
Chelsea	1	7	7	35/-	—	4 0 0
City of London	1	7½	7½	37/-	—	4 1 1
Clyde Valley	1	7	7	42/6	+6d.	3 5 8
County of London...	1	10½	10½	59/6	—	3 11 0
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	48/9	—	3 13 9
Elec. Supply Corporation ...	1	11	11	76/3	—	2 17 8
Kensington Ordinary	1	7	7	35/-	—	4 0 0
Lancs Light and Power	1	7	7½	38/9	—	3 17 4
London Electric	1	7	7	35/6	—	3 19 0
Metropolitan	1	10	10	52/6	−¼	3 16 3
Midland Counties	1	7	7	38/9	—	3 12 0
Mid. Elec. Power	1	8	8	43/9	—	3 13 0
North Eastern Electric Ordinary	1	6	6	35/6	—	3 7 8
Do. 7% Pref.	1	7	7	35/-	+6d.	4 0 0
Northampton	1	10	10	50/3	—	3 11 3
Notting Hill 6% Pref.	10	6	6	13¾	—	4 8 11
North Met. Elec. Ordinary ...	1	10	10	63/9	—	3 2 10
Do. do. 6% Pref. ...	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall... ...	1	7	7½	36/6	—	4 3 4
Scottish Power	1	8	—	2¼	—	3 15 6
South London	1	7	7	35/6	—	3 19 0
Westminster Ordinary	1	7	7	35/-	—	4 0 0
Whiteball Elec. Invst. 7½% Pref.	1	7½	7½	22/-	—	6 16 4
Yorkshire Elec.	1	8	8	49/6	—	3 4 9

Public Boards.

		1931.	1932.			
Central Electricity, 1950–70 ...	Stock	5	5	113	—	4 8 6
Do. 1955–75 ...	,,	5	5	115	—	4 7 0
Do. 1951–73 ...	,,	4½	4½	109½	—	4 2 2
Do. 1963–93 ...	,,	—	3½	96	—	3 13 0
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A...	,,	—	4½	118½	—	3 16 0
Do. do. B...	,,	—	5	120½	—	4 3 0
Do. do. C...	,,	—	—	78½	+1¼	—
West Midlands Joint Elec. 1948–68	,,	—	5	113	—	4 8 6

Telegraph and Telephones.

American Tel. & Tel.	$100	9	9	115½	—	7 15 10
Anglo-Am. Tel. Pref.	Stock	6	6	113	—	5 6 2
Do. Def.	,,	1½	1½	28	—	5 7 2
Cables & Wireless 5½% Pref. ...	,,	2¾	2¾	71½	−1	3 17 0
Do. A. 7½% Ord.	,,	Nil	Nil	22	−1	—
Do. B. Ord.	,,	Nil	Nil	10	—	—
Globe Tel. and T. Ord.	10	Nil	2½	9¾	—	2 11 3
Do. do. Pref.	10	6	6	12¾	—	4 13 4
Great Northern Tel.	10	20	20	38	—	5 5 3
Marconi-Marine	1	10	7½	32/-	+2/-	4 13 9
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	2/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,	5	5	600	+30	—
Do. do. Pref. Ord.	,,	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	10¾	−⅜	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102½	—	4 17 6
Mexico Trams, 5% Bonds ...	—	5	5	19½	—	25 12 8
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds...	—	5	5	50½	—	9 18 0
Victoria Falls Ord.	1	15	20	5⅛	—	3 7 4
Yorkshire (West Riding)	1	2½	5	18/9	—	5 6 8

Manufacturing Companies.

Assoc. Elec. Ord.	1	4	3	16/3	+3d.	3 14 0
Do. Pref.	1	8	8	31/3	—	5 2 5
Babcock & Wilcox	1	14	9	45/9	+9d.	—
British Aluminium Ord.	1	5	5	29/0	—	3 9 0
British Insulated Ord.	1	15	15	72/6	—	4 2 8
Brush Ord....	Stock	Nil	Nil	38	—	—
Callender's...	1	15	15	57/6	−¼	5 4 4
Do. 6½% Pref....	1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord. ...	5/-	22½	12½	25/-	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	85/-	—	4 14 1
English Electric	1	Nil	Nil	7/6	+¼	—
Do. do. Pref.	1	Nil	Nil	7/6	−¼	—
Ever Ready	5/-	35	35	29/6	—	5 18 8
Ferranti Pref.	1	7	7	26/-	—	5 7 9
G.E.C. Pref.	1	6½	6½	30/-	—	4 6 8
Do. Ord.	1	8	8	42/-	—	3 16 1
Henley's	1	30	30	6	—	4 17 10
Do. 4½% Pref....	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	15/-	—	—
Johnson & Phillips	1	5	5	1	+6d.	5 0 0
Siemens Ord.	1	7½	6½	18/9	−9d.	—
Telegraph Construction	£1	Nil	Nil	23/9	−¼	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1931

31355. "Sparking plug." J. E. Jowitt. September 12th, 1932. (407059.)

1932

15675. "Rotary electric rectifiers." F. J. S. Jones. June 2nd, 1932. (406997.)

18401. "Voltage conversion systems utilising electric arcs." E. Marx. June 29th, 1931. (406999.)

18677. "Electric control systems, particularly for electric theatre and like lighting, motor, and other loads." H. Baron (A. S. FitzGerald). July 1st, 1932. (407014.)

18766. "Arrangement of voltage regulators for alternating-current machines." Allmänna Svenska Elektriska Aktiebolaget. July 4th, 1931. (407015.)

21427. "Illuminated signs." Claude-General Neon Lights, Ltd., and C. Higgins. July 29th, 1932. (406982.)

23719. "Electro-therapeutic apparatus." P. C. Rawls and Technical Equipment Co. August 24th, 1932. (407021.)

23883. "Electric arc welding." Akt.-Ges. Brown Boveri et Cie. August 29th, 1931. (407022.)

24312. "Electrical converting arrangements comprising mercury-arc rectifiers." General Electric Co., Ltd., C. C. Garrard, and H. H. Renner. August 31st, 1932. (407042.)

24391. "Devices for making electrical connections." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. September 1st, 1932. (406990.)

24510. "Electrostatic dust or like separation apparatus." Sturtevant Engineering Co., Ltd., and H. W. Wagner. September 2nd, 1932. (407043.)

24557. "Regulating resistances, potentiometers, and the like." Elektrische Gluhlampenfabrik J. Kremenezky Akt.-Ges. January 7th, 1932. (407068.)

24617. "Sockets, pins, plugs and other components used for electrical or other purposes." L. H. Reid. September 3rd, 1932. (407069.)

24846. "Road traffic control systems." Siemens & General Electric Railway Signal Co., Ltd., and F. A. Edwards. September 6th, 1932. (406993.)

24969. "Electric control systems employing saturable reactances." British Thomson-Houston Co., Ltd. September 11th, 1931. (407073.)

25083. "Electric secondary or storage batteries." Drumm Battery Co., Ltd., J. J. Drumm, T. Hagyard, and R. H. D. Barklie. September 8th, 1932. (Addition to 365125, 393629, 396101, and 10372/32.) (407074.)

25221. "Selective receivers for wave signals." J. Robinson and British Radiostat Corporation, Ltd. September 9th, 1932. (407057.)

25325. "Frequency control of a valve oscillator." G. B. Baker. September 12th, 1932. (407079.)

25668. "Vacuum tubes for ultra-short wave signalling." International Communications Laboratories, Inc., and A. G. Clavier. September 15th, 1932. (407087.)

25980. "Luminous signs." W. E. Woodley. September, 19th, 1932. (407095.)

26044. "Electric conductors suitable for high-frequency transmission." British Insulated Cables, Ltd., A. L. Blake, and W. R. Lauder. September 19th, 1932. (Cognate applications, 26801/32 and 11053/33.) (407096.)

26833. "Electrically controlled oil-burning apparatus." A. Marsden. September 27th, 1932. (407106.)

26917. "Means for reinforcing signalling electric currents traversing long lines." Igranic Electric Co., Ltd., and L. H. Paddle. September 28th, 1932. (407107.)

27445. "Electric energising apparatus." International General Electric Co., Inc. October 2nd, 1931. (407113.)

27566. "Systems for the transmission of angular motion." British Thomson-Houston Co., Ltd., and R. D. Given. October 4th, 1932. (407114.)

27572. "Mercury-arc rectifiers." General Electric Co., Ltd., and F. J. Fisher. October 4th, 1932. (407115.)

27779. "Mounting of electric immersion heaters and other articles in the walls of tanks." General Electric Co., Ltd., and C. W. Stopford. October 6th, 1932. (407117.)

27888. "Electric signalling apparatus." Chad Valley Co., Ltd., and E. H. Powell. October 7th, 1932. (407119.)

31841. "Electromagnetic devices with axially movable armatures." H. E. Kennedy. November 10th, 1932. (407139.)

33755. "Continuous-current generators." Akt.-Ges. Brown Boveri et Cie. December 4th, 1931. (407149.)

35698. "Electric lighting units." General Electric Co., Ltd., and W. F. S. Debenham. December 16th, 1932. (407155.)

36583. "Electric lampholder." G. Turnock. December 24th, 1932. (407160.)

1933

1163. "Ultra-short-wave high-frequency amplifier." M. Von. Ardenne. January 14th, 1932. (407166.)

5736. "Electric treadle or mat switches." National Pneumatic Co. May 21st, 1932. (407184.)

9577. "Aerials for wireless reception." H. A. Ewen. March 30th, 1933. (407201.)

10348. "Electric control switches." International General Electric Co., Inc. April 6th, 1932. (407205.)

12972. "Swivelling bases for overhead electric trolley poles." S. S. Guy. May 4th, 1933. (407212.)

13567. "Electric battery lamps." Batterien-Elemente-Fabrik Systems Zeiler Akt.-Ges. September 19th, 1932. (407215.)

15107. "Loud-speaker." H. Olivestone. May 25th, 1933. (407217.)

15823. "Interphase transformers for rectifier systems." Westinghouse Electric & Manufacturing Co. June 1st, 1932. (407222.)

16091. "Polyphase rectifier systems." Westinghouse Electric & Manufacturing Co. June 4th, 1932. (407224.)

17705. "Electric and other welding machines." British Thomson-Houston Co., Ltd. June 25th, 1932. (407229.)

18181. "Telekinematographic transmitters." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. June 25th, 1932. (407230.)

19657. "Electric discharge devices having control grids." Allmänna Svenska Elektriska Aktiebolaget. July 11th, 1932. (407236.)

21147. "Power supply systems for electrically driven vehicles." Soc. Parisienne pour l'Industrie des Chemins de Fer et des Tramways Electriques. August 10th, 1932. (407244.)

24293. "Temperature responsive devices for controlling electrically operated devices." T. E. Perks. September 1st, 1933. (407264.)

28329. "Manufacture of spark plugs." A.C. Spark Plug Co. April 26th, 1933. (407275.)

29315. "Automatically controlled low-frequency thermionic amplifiers." Cromwell (Southampton), Ltd., and H. A. Brooke. October 23rd, 1933. (407278.)

29768. "Carbon bow current collector for electric vehicles." E. Conradty and O. Conradty (trading as C. Conradty, a firm). October 27th, 1933. (407281.)

30728. "Spark plugs." A.C. Spark Plug Co. June 22nd, 1933. (407282.)

32362. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges.). November 20th, 1933. (407286.)

33607. "Method of, and means for, heating a container electrically." C. A. Ross. November 30th, 1933. (407288.)

36481. "Electric cut-outs of the fuse cartridge type." H. Oertel. December 28th, 1933. (407293.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 28th:—

Solloy. No. 547919. Class 5. Solder.—Metropolitan-Vickers Electrical Co., Ltd., Bush House, Aldwych, W.C.2.

Goltone (lettering and design). No. 537781. All goods in Class 8.—Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester.

Lokinex, Odinex, Thornex, and Mithranax. Nos. 548391, 548392, 548393 and 548414. Class 16. Porcelain and earthenware. —Steatite & Porcelain Products, Ltd., Bewdley Road, Stourport, Worcestershire.

Bel-Aire. No. 548917. Class 18. Electric heating stoves.—Slate Slab Products, Ltd., Stevenage Wharf, Stevenage Road, Fulham, S.W.6.

The Paddington Train Arrival Indicator

THE train indicator that has been put into commission at the Paddington station of the Great Western Railway is situated in a prominent position on the circulating platform. One side gives information about train arrivals and is divided into eight panels (for as many trains), each of which is arranged to display the time a train is due; platform number; minutes late; and list of stations at which the train has stopped to pick up passengers. On the reverse side a list of train departures is posted, but this follows standard practice. The novel point of the indicator is that the particulars for each train travelling to Paddington are set up automatically by a "magazine" and are stored until required, when an operator in a remote cabin presses keys corresponding to the number of the train concerned.

A miniature panel in the control office, which is adjacent to the operating mechanism, keeps the operator informed of the particulars displayed on the main indicator. Some time before the train is due to arrive the operator keys its number, thus connecting the magazine to a disengaged panel on the main indicator to which the stored information is transmitted. Simultaneously, check-back circuits from the main indicator cause the selected train number to appear on the miniature panel in the control room and also automatically re-set the keys which originated the operation to the normal position. The platform number and the minutes late can be similarly signalled to the main indicator as soon as they are known. After arrival of the trains the indicator is cleared.

During fogs or for special working, manual control can be substituted for the magazine feature, and any combination of station names can be set up. Separate switches are provided for each day of the week to avoid the possibility of error on the part of the operator, *e.g.*, in setting up a "Saturdays only" train on some other day.

Current for operating the indicator (7 to 8 A) is obtained from a 48-V battery, which is kept charged from the a.c., l.v. mains through a transrector. The average consumption is only about 200 kWh per hour.

The new indicator system has been supplied by the Siemens & General Electric Railway Signal Co., Ltd., and has been designed and manufactured by its associated company, Siemens Bros. & Co., Ltd. The design and materials are British throughout.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Public baths, Aberaman (£3,105); U.D.C. surveyor.

Aberdeen.—Maternity hospital, Foresterhill (£40,000); J. G. Paul, chairman of directors, Maternity Hospital.

Barking.—Houses (150), Movers Lane Estate; C. J. Dawson, Son & Allardyce, architects, Clock House Chambers.

Barnsley.—Isolation block and operating theatre (£4,100), Municipal Hospital; P. P. Taylor, (Doncaster), Ltd., builders.

Bath.—School (330 places), Whiteway Road, for City E.C.; A. W. Hoyle, director of education.

Bexhill-on-Sea.—Estate development, Pear Tree Lane; J. Asher.

Blackburn.—Bank, Church Street, for the Union Bank of Manchester, Ltd., York Street, Manchester; Sames & Green, 14, Richmond Terrace, architects.

Blackwell.—Houses (32); H. T. Sudbury, R.D.C. architect, Rutland Chambers, Lord Haddon Road, Ilkeston.

Blyth.—Houses (48), Hodgsons Road; L. Leeper, borough engineer, Town Hall.

Bolton.—Houses (60), Crompton Fold Estate; Wm. Gornall & Sons, Ltd. Cinema, Crompton Way, for the Crompton Way Cinema, Ltd. (£20,000); W. & S. Bradley, architects, Bank Chambers, 13, Mawdesley Street. Workshop extensions, Romer Street; Haslams, Ltd. Alterations to Capital Cinema; Capitol Cinema, Ltd.

Bournemouth.—Houses (24), Ashford Road; J. N. Hardy. Development of Haddon Hill Estate and large nursing home; Guilleaume & Sons. Development of Ringwood Road; E. de Wilde Holding. Estate development, Wimborne Road, Ensbury; Tomlinson & Matley. School centre, Winton; borough engineer. Alterations and additions to Southbourne High School, Beaufort Road; Miss G. Greaves.

Bromley (Kent).—Houses (20), Chatsworth Avenue, for Chalet Estates, Ltd.

Burnopfield.—Alterations to Council School; F. Willey, architect, 34, Old Elvet, Durham.

Bury St. Edmund's.—Houses (40) and flats; borough surveyor.

Catterick Camp.—Houses (200) for C. Walker; H. Coxhead & Co., builders, Davison Street, Middlesbrough.

Chester.—Extensions to Royal Infirmary, nurses' home; Douglas, Minshull & Williams, architects 6, Abbey Square.

Chesterfield.—Houses (67), Barker Lane Housing Estate (£19,829); A. Chapman & Sons, Ltd., builders, Wadsley Bridge, Sheffield. Houses (71), Barker Lane Housing Estate (£20,907); William Drabble & Sons, Mosborough, near Sheffield. Houses (1,527), Frecheville, Beighton, for the First National Housing Trust, Ltd.

Chester-le-Street.—Extensions to isolation block for the hospital of the Joint Hospital Board; E. M. Lawson, architect, 19, Ridley Place, Newcastle-on-Tyne.

Coventry.—Hospital extensions (£50,000), for the Governors of Coventry and Warwickshire Hospital; secretary.

Croydon.—Houses (92), Long Lane, and extensions to baths and washhouses, Windmill Road; borough engineer. Factory, Cherry Orchard Road; Ogden Smith. School, Goodwin Road, Waddon, for E.C.; Horace Newby, Ltd. Stores, 116-120, North End; Marks & Spencer, Ltd. Alterations and additions to 35-37, High Street; F. W. Woolworth & Co., Ltd. Alterations and additions to 83-87, London Road; H. J. Searle & Son, Ltd.

Dundee.—School, Lochee (£26,665); city architect.

Durham.—School clinic and welfare centre, Billingham; county architect. Additional classrooms to Council School, Bishop Auckland, for C.C. (£10,000); F. Willey, architect, 34, Old Elvet. Extensions to Post Office; H.M. Office of Works, London.

East Suffolk.—Children's homes, Lowestoft, for C.C.; clerk, Ipswich.

Edinburgh.—Houses (350), Davidsons Mains, for MacTaggart & Mickel, Ltd., 65, Bath Street, Glasgow; Stewart Kaye, architect, 14, Hill Street.

Essex.—Senior school (480 places), New Redden Court Estate, Harold Wood, for County E.C.; J. Sargent, director of education, Chelmsford.

Fulwood (Near Preston).—Council room and office alterations, &c., Council Offices, Garstang Road; J. J. Allen & Sons, Ltd., builders, Bostock Street, Preston.

Gateshead-on-Tyne.—Houses (30), Old Durham Road; J. G. Bennison, builders, Harcourt Park.

Glasgow.—Extensions, Mosspark Cinema, Paisley Road West; P. Crerar. Factory extension, Halley Street; William Rankin & Sons.

Gosberton Clough.—Church for the Chapel Committee of the Methodist Union; W. Barnsdale & Sons, builders, Donington, near Spalding.

Guildford.—Flats (91), Portsmouth Road and Millmead Terrace; Stone Ridge Estates, Ltd. Cinema, Belmont House site; Odeon (Guildford), Ltd.

Hastings.—Reconstruction of Old Town area (£76,651); borough engineer.

Hereford.—Estate development, Ross Road and Holme Lacy Road; Mr. Maton.

Hornchurch.—Bazaar stores, High Street, for F. W. Woolworth & Co., Ltd., London.

Hoylake and West Kirby.—Houses (75); U.D.C. surveyor.

Huddersfield.—Extensions to works for George Mallinson & Sons, Ltd., Spring Grove Mills, Linthwaite.

Hull.—Senior school (£16,443), by direct labour; city engineer.

Inverness.—Extensions to district asylum (electrical work), for the Joint Committee; Alexander Ross & Son, architects.

Irish Free State.—(Co. Mayo).—Hospitals at Ballina, Belmullet, Claremorris and Swinford, for the Board of Health, Castleford; Mr. Munden, chartered architect, 1, South Frederick Street, Dublin.

Keswick.—Factory, Southey Hill, for the Cumberland Pencil Co., Ltd.; P. M. Hope, architect, Kendal.

Lanarkshire.—Houses (208) (electrical work), for C.C.; P. C. Smith, housing engineer, 13, Clydesdale Street, Hamilton.

Leeds.—Houses (120), Gipton Estate (£33,664); Paul Rhodes, Ltd. Bath extensions, Meanwood Road (£8,040); Matthews & Sons. Cinema, Lower Wortley Street; C. Armitage, architect, Cabinet Chambers, Basinghall Street. Schools for the Parish of Our Lady of the Rosary for the authorities of the Cathedral Church, St. Annes, Cookridge Street; Marten & Burnett, architects, 76, Albion Street.

Lewes.—Extensions to Victoria Hospital (£6,000); secretary.

Liverpool.—Buildings, Rathbone Road, directors of Liverpool Hide & Skin Market; Kenmure Kinna, architect, 14, Castle Street. Extensions, offices, Fairfield Biscuit Works, for Crawford & Sons, Ltd.; Joshua Henshaw & Sons, Ltd., builders, 8, Chatham Street.

London.—(Bermondsey).—Flats on six estates (£100,000); borough engineer. (Catford).—Houses (41), Marvels Lane; H. Thoburn, Ltd. (Edmonton).—Factory; Standard Fireworks Co., Ltd. (Forest Hill).—Shops, flats and houses, Bromley Road and Danaby Avenue; G. T. Harman. (Hammersmith).—Town hall (£163,594); Sir A. Brumwell Thomas, architect. (Hampstead).—Flats (24), Lyttleton Road, Garden Suburb; Lloyds Properties, Ltd. Dwellings (290), West Croft Farm (£108,750); borough engineer. (Hornsey).—Pumping plant, waterworks (£16,500); engineer, Metropolitan Water Board. (Lambeth).—Fire brigade headquarters, Albert Embankment (£85,000); L.C.C. architect. (Lewisham).—Houses (47), Woodlands Estate; P. B. Dannatt. Store extensions, High Street; Royal Arsenal Co-operative Society, Ltd. (Southgate).—Town hall, extensions (£4,000); borough engineer. (Walthamstow).—Electricity offices and showrooms (£52,000) for U.D.C.

Manchester.—Cinema, junction of Moorside Road and Princess Road, Urmston, for Captain F. S. Eaton, Urmston; A. Winstanley, architect, 15, Gt. Ducie Street. Factory, Longley Lane, Northenden, for R. Sowden & Co., Ltd., 51, Grosvenor Street; Normanton's, Ltd., builders, Fern Works, 167, Plymouth Grove, Longsight. Shopping centre, Kingsway Road, Didsbury; Longworth & Taylor, Ltd., builders, Longfield Estate, Ramsbottom.

Middlesbrough.—Houses (200), Whinney Banks and Brambles Farm Estates, and 60 houses for aged people; S. E. Burgess, borough engineer, Town Hall.

Middlesex.—Farm buildings, &c., mental colony, Shenley (£23,000); county architect. Schools, Vincent Road, Alperton, and Manor House site, Hayes, for County E.C.

Nuneaton.—Church for the Minister, Rev. L. Johnson; Wesleyan Church Members.

Oswaldtwistle.—Houses (138), Intack Estate; Lancaster, Son & Parkinson.

Prestwich.—Extensions to bakery, Warwick Street, for the Co-operative Society, Ltd.; Brew Bros., builders, Cadishead, Manchester.

Renfrewshire.—Schools, Paisley district; architect, County E.C., Paisley.

St. Leonards-on-Sea.—Catholic Church, Upper Church Road, Horrington, for the Catholic Diocesan Finance Board; T. Wallis, builder, Bexhill-on-Sea.

Sale.—Houses (392) and shops, Brooklands Road, Brooklands; Jonathan Partington, Ltd., builders, Middleton Junction.

Seaham.—Houses (138); J. B. Abbey, U.D.C. surveyor.

Sheffield.—Senior and Junior School, Hartley Brook Road, Low Shiregreen (£38,200); W. B. Robson, Ltd., builders, Bamforth Street.

Shirley.—School, West Way (£3,245); H. H. & F. Roll, Ltd., Epsom.

Smethwick.—Extensions to North Works, Halfords Lane; Henry Hope & Sons, Ltd. Reconstruction of 63-4, Cranford Street; W. J. Eakins.

Staffordshire.—Admission hospital, extensions to nurses' home, and convalescent villas, Burntwood Hospital, for the Mental Hospitals Board; K. L. Murray, architect, County Buildings, Stafford.

Stockport.—Houses (800), Hall Farm Estate, Stockport, for the Adswood Estate Co., Cooper Street, Manchester; J. Lloyd Edwards, architect, 1, Ridgefield, Manchester.

Stockton-on-Tees.—Houses, junction of Durham Road and Stavordale Road; G. Fordy, builder, Durham Road. Houses, junction of Oxbridge Lane and Green Lane; R. W. Russell and Sons, builders, 7, Gainford Street. Theatre, Borough Hall site, for a private syndicate; W. Fawcett, solicitor, Marton (Yorks).

Stoke-on-Trent.—Central Hall, Cricket Ground site (£10,000); Stoke-on-Trent Fat Stock Society.

Sunderland.—School, six years' building programme, for County E.C. (£423,000); education architect, John Street.

Teddington.—Bazaar stores, Broad Street, for F. W. Woolworth & Co., Ltd., London.

Tynemouth.—Houses (238), Ridges Estate; J. L. Beckett, borough engineer, Howard Street, North Shields.

Wallsend.—Houses (36), Kings Road; W. C. Leech, builder, Coutts Road, Walker Gate.

Walsall.—Extensions to factory, Midland Road, for the Walsall Lithographic Co., Ltd.; Thompson & Arblaster, Ltd., builders, Lower Rushall Street.

Whickham-on-Tyne.—Houses (40), Swalwell (£11,481); H. Kindred, builder, Sunniside, Durham. Houses (34), Dunston (£9,636); Shield Brothers, builders, Swalwell.

Whitby.—Houses (30), Upgang Lane; W. Cornforth, builder, 1, Skinner Street.

Whitefield.—Cinema, Bury Old Road, Besses o' th' Barn, for the Red Rose Cinema Co., Ltd.; Alistair G. MacDonald, architect, 15, Queen Anne's Gate, London, S.W.1.

Worthing.—Assembly hall (£40,000); borough surveyor.

Yeovil.—Cinema, The Triangle (electrical work), for the Gaumont-British Picture Corporation, Ltd.; W. E. Trent, architect, 96, Hermon Hill, London, E.